NASA LONG RANGE TECHNOLOGY GOALS

VOLUME

TASK 2 REPORT III

CONTRACT NASW - 3864

II. U.S. Industrial Sector Tech. Goals

III. Social, Health, & Security Tech. Goals

IV. Functional Space Mission Technologies

V. Recommended Long Range Tech. Goals

This Volume contains findings pertaining to the status of the nonindustrial aspirations of the U.S.

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NASA Long Range Technology Goals

Volume III

Task 2 Report

CONTRACT NASW-3864

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FOREWORD

This document is part of the Final Report performed under contract NASW-3864, titled "NASA Long Range Technology Goals."

The objectives of the effort were:

- To identify technologies whose development falls within NASA's capability and purview, and which have potential for leapfrog advances in the national industrial posture in the 2005-2010 era.

- To define which of these technologies can also enable quantum jumps in the national space program.

- To assess mechanisms of interaction between NASA and industry constituencies for realizing the leapfrog technologies.

This Volume contains findings pertaining to the status of the nonindustrial aspirations of the U.S.

OUTLINE OF VOLUMES

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SATISFYING THE NEEDS AND ASPIRATIONS OF THE AMERICAN PEOPLE

C.0 BACKGROUND AND PURPOSE

This Volume represents an assessment of U.S. aspirations for health, security and the pursuit of happiness. These aspirations may be summarized as follows:

- Health--maintenance of physical and psychological well-being;
- Security--assurance of tranquility or protection from man-made and/or natural violence;
- Pursuit of Happiness--the capacity to reach a maximum level of self-fulfillment and societal standing.

The U.S. is one of the few developed nations with no "national plan" for the fulfillment of personal "aspirations;" the individual, as well as any collective can therefore strive toward self-defined goals. The realization of these goals has been traditionally facilitated through economic growth and improvements in the quality of American life.

"Pursuit of happiness" aspirations, in the U.S., are more difficult to define than those associated with wealth, health and security. Nevertheless, the allocation of U.S. resources toward the pursuit of happiness as a percent of GNP, has increased 0.4%, in constant dollars, from 1970 to 1980. For the same period, health allocations increased by 1.5%, while those for wealth and security decreased by 1.0% and 0.9% respectively.

Figure 0-1 enumerates the resources allocated for the three noneconomic aspiration categories, plus those connected with wealth. The increasing amount of financial resources allocated for health and happiness in recent years suggests certain structural changes in our society, where less of the population is selfsustaining and corporations provide the majority of retirement, job security and medical care benefits.

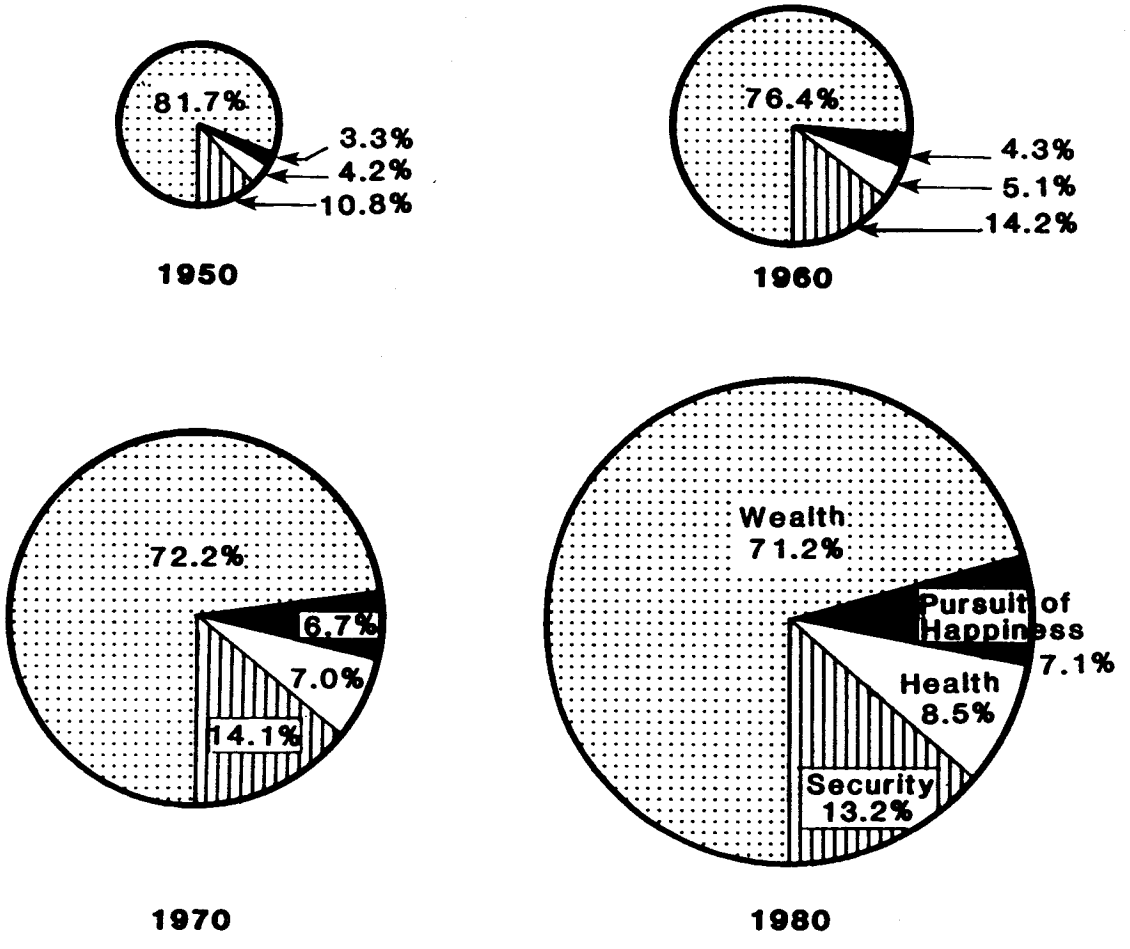

Figure 0-1. Relative Allocation of U.S. Resources Among Economic and Non-Economic Aspirations
(in Percent of GNP at Constant Dollars -- Includes Public and Private Expenditures)

C.1 HEALTH

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SOURCES: U.S. DOC/BOC:
Statistical Abstract of the U.S., 1982-3
World Health Organization
National Institute of Health
U.S. Department of Health and Human Services
Annuario Statistico Italiano
Ministry of Health and Welfare, Japan

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C.1 HEALTH

The relative, constant dollar allocation of U.S. resources for health has increased from 4.2% in 1950 to 8.5% in 1980. A large proportion of these allocations has been earmarked for aerospace technology, which has contributed to advanced techniques of diagnostics, micro and laser surgery, and monitoring/detection. Such achievements represent a framework for further refinements in treatments, medicine and research practices in our health facilities.

Gross statistics, such as the decline in infant mortality and the increase in longevity, are frequently used to compare the level of health among countries. While such statistics provide a crude comparison among industrialized and third-world nations, they do not yield suitable distinctions among industrialized societies. To illustrate, the traditional measures of health comparing the U.S. with two industrialized nations are shown in Table 1-1. These data would indicate that the U.S. lags behind Italy and Japan in life expectancy and assumes an intermediate position between these two industrialized societies with regard to infant mortality.

To obtain a more sophisticated insight into general societal health and the status of health care in industrializedques of diagnostics, micro and laser surgery, and monitoring/detection. Such achievements represent a framework for further refinements in treatments, medicine and research practices in our health facilities.

The aspiration for health connotes the desire for personal physical and mental well-being throughout one's lifetime. This entails: 1) freedom from diseases and/or organically-induced handicaps; 2) correction of handicapping conditions induced by unfortunate situations or accidents.

TABLE 1-1

INFANT MORTALITY AND LIFE EXPECTANCY

		INFANT MORTALITY PER 1,000	LIFE EXPECTANCY AT BIRTH (YEARS)	
			MALE	FEMALE
U.S.	1973	17.1	67.6	75.3
	1980	12.5	69.9	77.8
JAPAN	1973	11.3	70.9	73.2
	1980	7.5	73.7	79.1
ITALY	1973	25.7	68.9	75.2
	1980	14.3	71.0	77.3[a]

[a] PROJECTED BASED ON HISTORICAL INCREASE OF 0.3 YEARS PER YEAR.

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1982-3

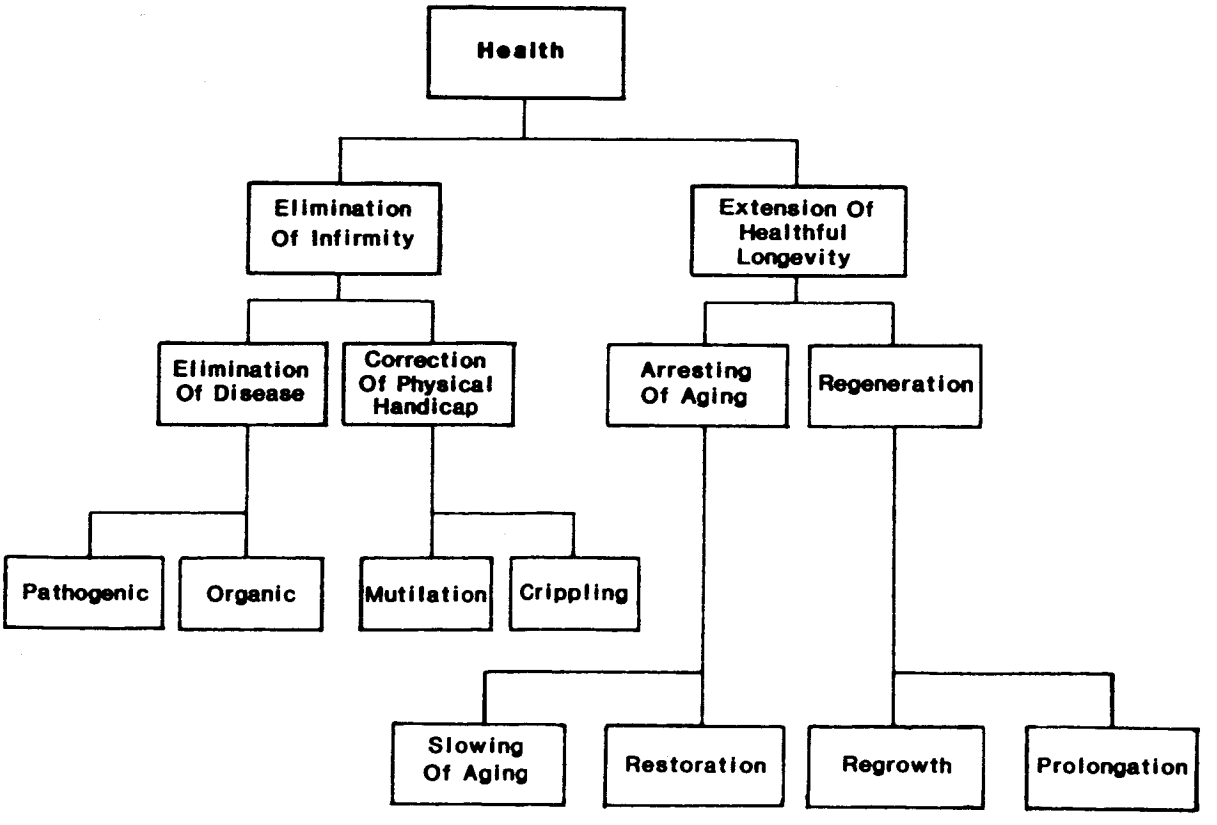


Figure 1-1. Categorization of Health Aspirations

A persistent desire of mankind is the prolongation of life. Although life expectancy has increased since the mid 19th century, man's desire is for extension of individual longevity, under continued healthful conditions.

Figure 1-1 depicts a top-down representation of health aspirations, as adapted from standard categorizations issued by the World Health Organization and National Institutes of Health.

The U.S. posture on health care, relative to other contemporary nations, will be examined in the following sections. Section C.1.1 presents the rationale and methodology to be employed in measuring and evaluating health policies; Section C.1.2 presents the medium and short-term technologies which are expected to be inaugurated over the next 25-30 years for the continued advancement of health. Advanced health technologies are presented in Sections E.5 and E.6.

C.1.1 CURRENT U.S. POSTURE ON HEALTH

There are four principal indicators of a nation's "health posture:" quality, quantity, productivity and equity:

- **Quality**--The incidence of pathogenic and major organic diseases; the number of physically handicapped individuals; life extension; and the educational level of primary medical care personnel.

- **Quantity**--The number of primary medical personnel (i.e., doctors and nurses) per 100,000 persons; the total number of hospitals and hospital beds; the number of general service (short-stay) hospitals and hospital beds.

- **Productivity**--The degree of utilization of general service (short-stay) hospitals; the patients' average

length of stay; the occupancy rate for beds in short-stay hospitals.

- **Equity**--The access to and the ability to afford medical care. This measures, by socioeconomic group, the means of financing medical care services and the ability of individuals to afford such care.

These indicators are related to the relative health postures of the U.S. and other industrialized nations and are discussed in the following analyses.

Quality of Available Health Care

Elimination of Disease

Following the classification presented in Figure 1-1, diseases can be grouped under two major categories:

- **Pathogenic**--Infectious and parasitic diseases caused primarily by external biological organisms, i.e., bacteria, fungi and arthropods.

- **Organic**--Disorders brought about through organ dysfunction and abnormal metabolic processes.

Analysis of these two disease categories produces the following findings.

The U.S. has historically maintained a lead over contemporary, industrialized nations in controlling pathogenic diseases, see Figure 1-2. Although these nations show continuing improvement in controlling infectious and parasitic diseases, their fatality rates remain 50-150% higher than the U.S. rate. However, while the overall U.S. performance has shown substantial progress up to the early 1970s in the elimination of the more

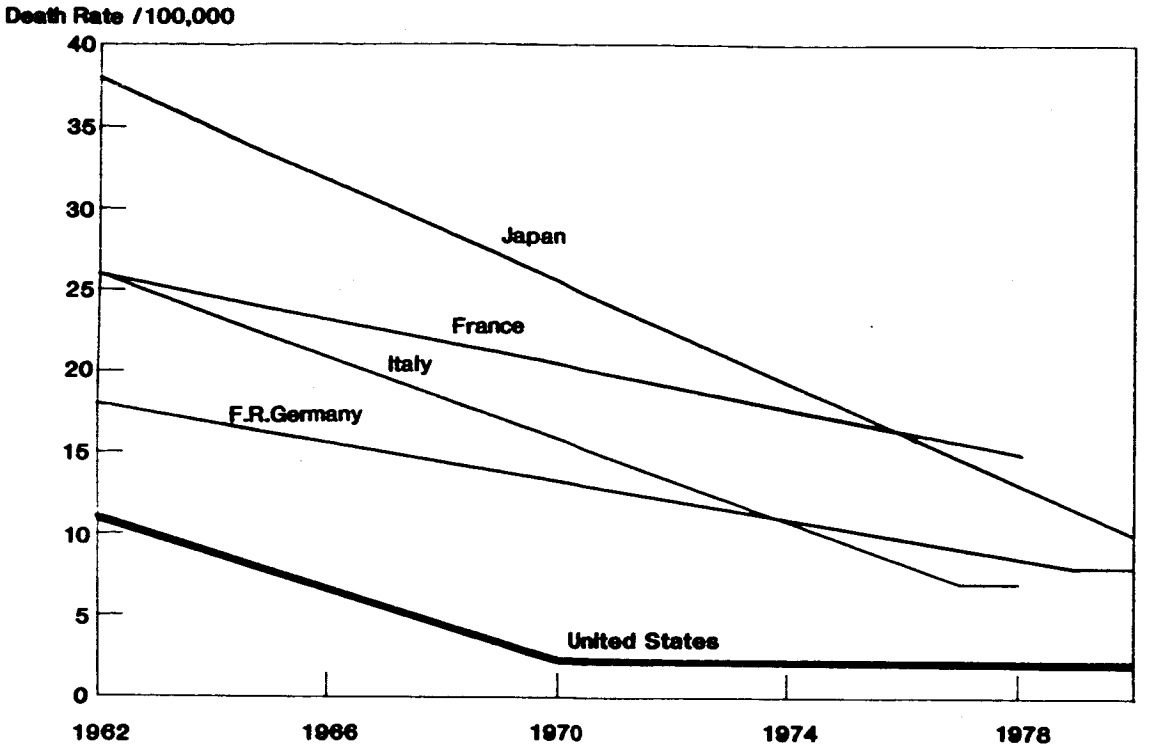
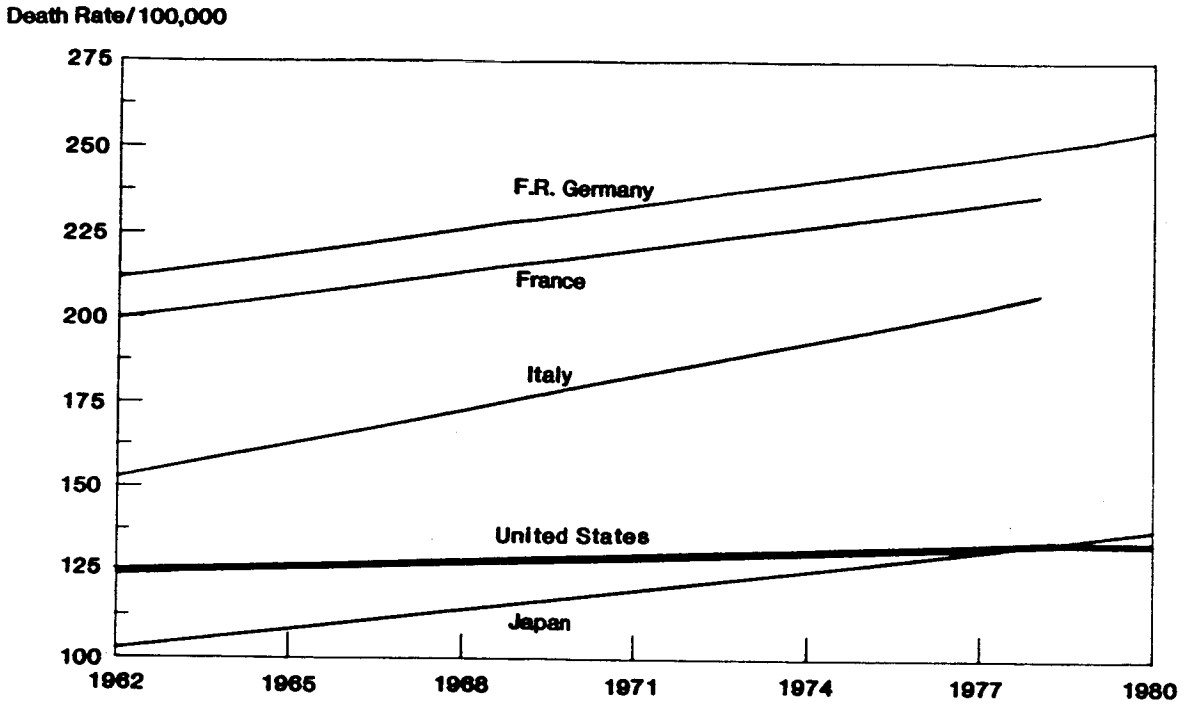


Figure 1-2. Infectious and Parasitic Diseases

common diseases, in recent years further reductions have not occurred. Traditionally, many of the common causes of pathogenic disease were eliminated through an emphasis on personal and community hygiene, sewage treatment plants and innoculations. Current emphasis is placed on research into, and cures for, new strains of these diseases and their control, an elimination of new pathogenic diseases (e.g., such as AIDS), and previously-ignored diseases.

With respect to the control of the two principal types of organic diseases, malignant neoplasms, cancer, and combined circulatory and heart disease, Figures 1-3 and 1-4 show the U.S. to be slightly ahead of the nearest runner-up nation, Japan, and significantly ahead of other nations. The consistant decline in cancer and heart diseases is indicative of the improved early detection, diagnostic care and new treatment technologies in the U.S. Laser and microsurgery, implants, radiation, chemotherapy and microelectronics are not as extensively available in most developed countries.



Malignant neoplasms include all cancers identified for the year data was obtained. New methodologies may account for rate increases.

Figure 1-3. Malignant Neoplasms

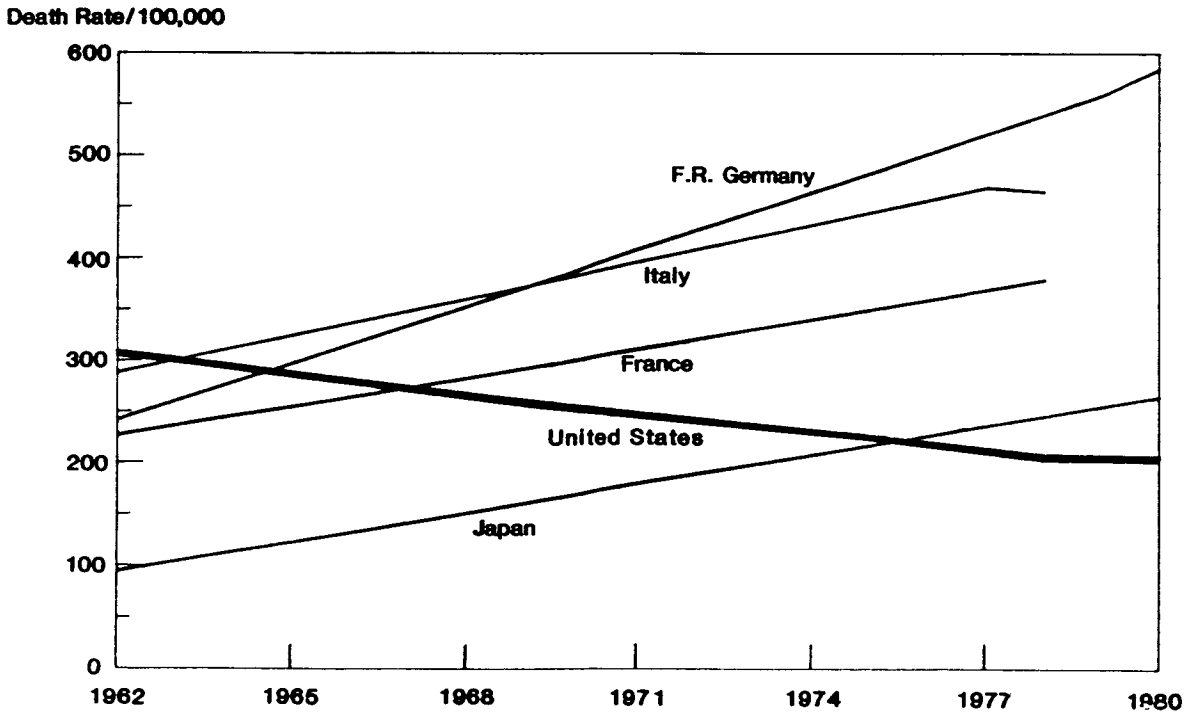


Figure 1-4. Circulatory and Heart Disease

Medical research and breakthroughs in the development of artificial devices would seem to suggest that further declines in, or even the elimination of diseases and death from many organic causes, are feasible over the next several decades.

Correction of Physical Handicaps

Physical handicaps are products of multiple or combined disorders that include birth defects, diseases, deterioration and accidents, resulting in pain and the partial or complete loss of the use of an organ or limb.

Examples of physical handicaps include full or partial paralysis, loss of senses such as sight, hearing, touch, taste, smell and organ or muscle deterioration, destruction or malfunction.

The correction or alleviation of physical handicaps encompasses technological restorations, replacements, and substitutions, some of which are temporary alleviations rather than permanent procedures. Crutches, wheelchairs, seeing eye or hearing ear dogs, blinking warning systems and closed-captioned programs for the hearing impaired, are temporary "fixes" which, though valid, will eventually become obsolete. Table 1-2 summarizes the number of people employing these artificial aids in the U.S. in 1980, categorized by type of aid.

The U.S. is the current leader in organ transplants, which are dictated by their availability and associated costs. Recent legislation in some states, and changes in medical insurance, now make transplants more feasible. New techniques and drugs that reduce rejection have increased patient survival rate and life expectancy and reduced the costs associated with a transplant. Research is being intensified to create artificial organs that will eventually eliminate the need for crosschecking blood and organ types and the prolonged wait for a donor.

TABLE 1-2

PERSONS IN THE U.S. USING
ARTIFICIAL AIDS BY TYPE OF AID, 1980

TECHNOLOGICAL	NUMBER OF PERSONS	RATE/1000 PERSONS
ARTIFICIAL ARM	35,387	.2
ARTIFICIAL LEG	141,778	.7
WHEEL CHAIR	719,609	3.3
LEG OR FOOT BRACE	472,440	2.2
OTHER BRACE	999,524	4.6
CRUTCHES	587,942	2.7
CANE	2,878,180	13.2
SPECIAL SHOES	1,343,642	6.2
WALKER	866.294	4.0
GUIDE DOG	3,807	—
OTHER AID	125,271	0.6
TOTAL	6,191,287	28.4

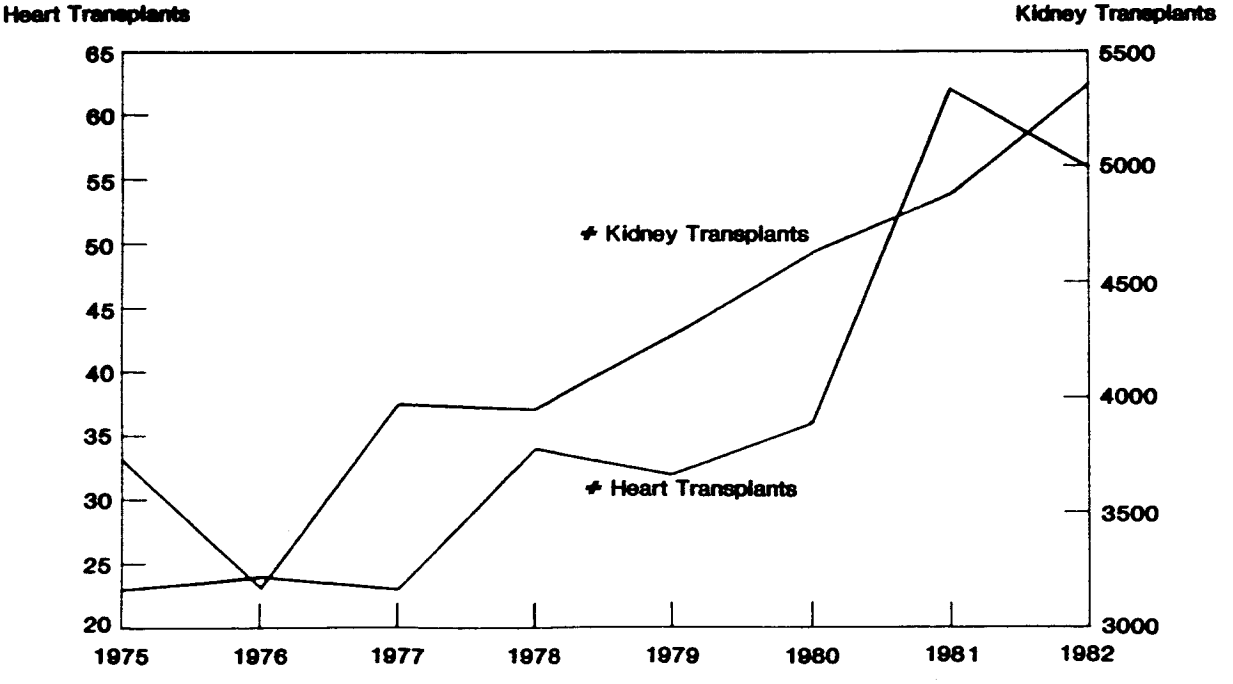


Figure 1-5. Regeneration by Organ Transplants

The first recorded human organ transplant, a corneal transplant to restore sight, was performed in 1905. In 1954, the first kidney transplant was performed, followed by the first bone marrow and lung transplants in 1963. Table 1-3 lists the currently available transplants with their associated success rates, numbers performed and their estimated cost ranges. Corneal transplants are the most common and provide the highest success rate; kidney transplants follow and then bone marrow transplants, whose tissue is the easiest to transplant, but poses the greatest risk to the patient. Figure 1-5 charts the history of the most commonly publicized transplants.

Organ transplants are on a rise, both through human donors and artificial means. In the future they may represent the safest method of restoring the human body by the replacement of limbs as well as internal organs.

Another indication of the state, if not the quality, of U.S. health is the number of individuals who have experienced a physical handicap.

Physical handicaps fall into two categories:

- **Loss of extremity/maiming**--physical loss of limb(s) or portions thereof.

- **Crippling**--complete or partial loss of the function of limb(s) or portions thereof (paralysis) and/or of sensory/motor functions.

The key indicator of the first category is the number of individuals who have experienced the loss of an extremity, see Figure 1-6. The principal indicator of the second category is the number of persons who have experienced a "paralytic" or "sensory denial" condition, see Figure 1-7.

TABLE 1-3

ORGAN TRANSPLANTS IN THE U.S.
(1973 THROUGH 1979)

TYPE	NUMBER	SUCCESS RATE	UNIT COST
CORNEA	128,000	90% IMPROVED VISION	$2,500-5,000
BONE MARROW	2,049	15% OF TERMINAL LEUKEMIA 80% APLASTIC ANEMIA 60% CHILDREN } ACUTE 40% ADULTS } LEUKEMIA	$6,000-150,000
LUNG	38	LONGEST SURVIVAL 10 MONTHS	$50,000-150,000
HEART-LUNG	22	13 STILL LIVING	$78,000-92,000
HEART	500	78% >1 YEAR 58% >3 YEARS 42% >5 YEARS	$57,000-110,000
LIVER	540	26% >1 YEAR	$54,000-238,000
PANCREAS	334	25% >1 YEAR	$18,000-50,000
KIDNEY	23,076	51% >1 YEAR 40% >3 YEARS 31% >5 YEARS	$25,000-35,000

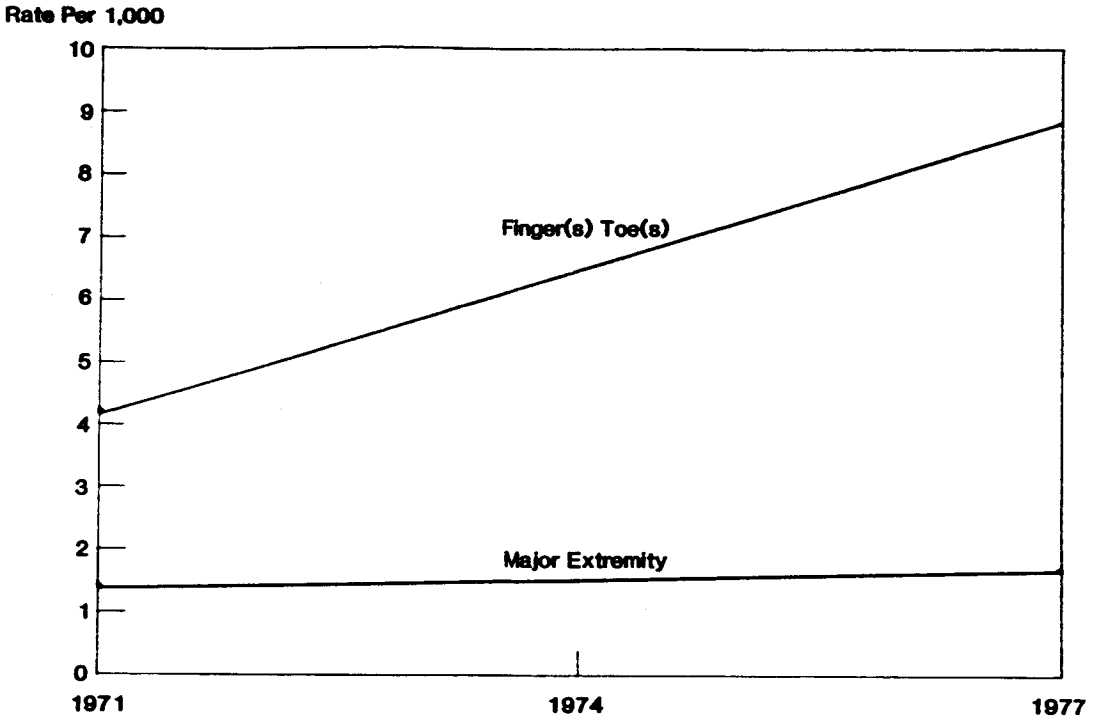


Figure 1-6. Loss of Extremity/Maiming

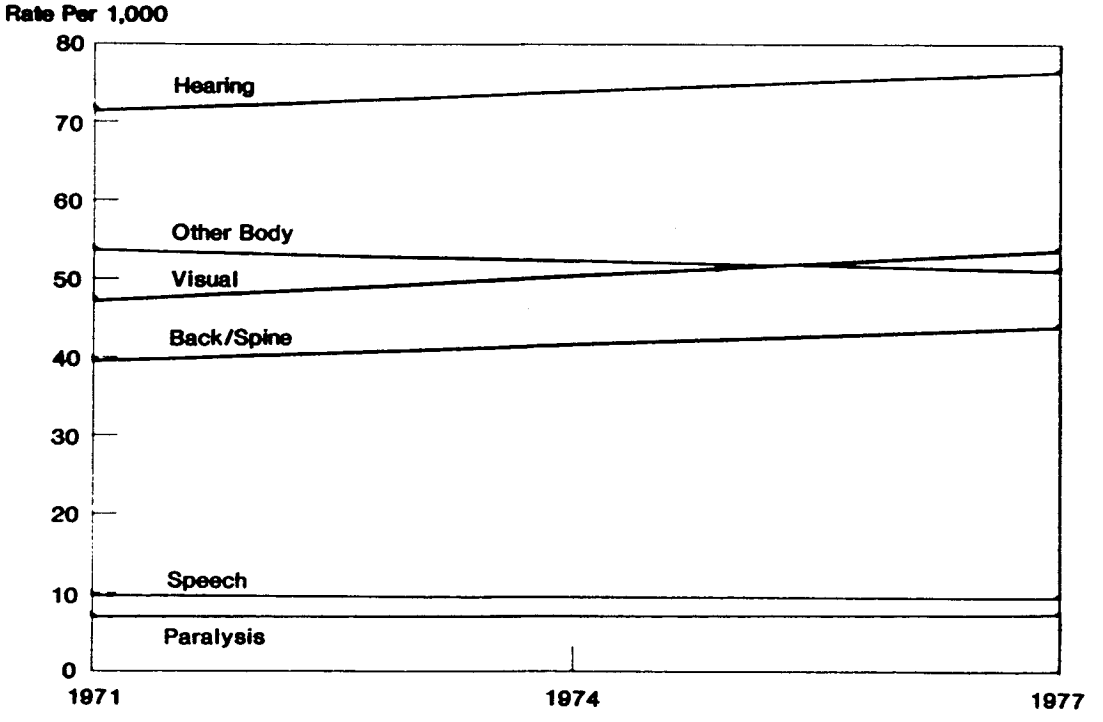


Figure 1-7. Crippling

The significance of the physical handicap data, Figures 1-6 and 1-7, is in the relative flatness of the trends in all categories except physical loss of the minor extremities (which shows a greater than 100% rise in occurrence).

Present levels of care and treatment for physical handicaps do not totally reflect the advances gained in alleviating the hardship of the handicapped. Federal requirements have been established to provide accessibility to buildings and properties for handicapped individuals; efforts are also being developed and refined to eliminate the segregation of the handicapped and make them active, participating members of society. Research techniques include the stimulation of nerves and muscles, either electronically or surgically, to reactivate damaged areas. Mechanical devices and bionics are other futuristic possibilities. Medical technologies that potentially eliminate or provide mobility for the handicapped are discussed in Section E.6.

Extension of Health Longevity

The extension of healthful longevity is currently being researched in the U.S. in two broad areas: 1) the aging process and 2) the regeneration of organs.

The arresting of the aging process is accomplished by two means:

- **Slowing of the aging process**--through hygiene, preventive medicine, etc.;
- **Restoration**--prolonging healthful life beyond its normal life span.

Key indicators of aging are: 1) the life expectancy at a given age for the most recent year, Table 1-4; and 2) the number of persons over 80 in the population, Table 1-5. The significance

TABLE 1-4

CONTINUED LIFE EXPECTANCY IN YEARS
AT A GIVEN AGE, BY SEX

COUNTRY	SEX	AGE IN YEARS					
		25	35	45	55	65	75
U.S. (1978)	M	47.0	37.8	28.9	20.8	14.1	8.9
	F	54.1	44.5	35.2	26.5	18.6	11.8
JAPAN (1980)	M	50.0	40.5	31.2	22.6	14.8	8.6
	F	55.2	45.4	35.9	26.7	18.0	10.6
FRANCE (1978)	M	47.4	38.0	29.0	21.0	14.1	8.9
	F	55.0	45.4	36.0	27.0	18.5	11.1
F.R. GERMANY (1979)	M	46.9	37.5	28.4	20.1	13.0	7.6
	F	53.0	43.3	33.9	24.9	16.7	9.7
ITALY (1977)	M	47.8	38.2	29.0	20.7	13.6	8.0
	F	53.7	43.9	34.4	25.3	16.9	9.8

TABLE 1-5

POPULATION OVER EIGHTY
(1,000s)

YEAR	U.S.	JAPAN	FRANCE	F.R. GERMANY	ITALY
1953	1,175	461	1,745	1,018	1,082
1955	1,275	573	1,782	1,206	---
1957	---	---	---	---	1,195
1960	1,399	718	1,999	1,438	1,264
1965	1,577	792	2,326	1,631	1,573
1967	2,798	827	2,406	1,704	1,635
1968	1,729	849	2,556	1,996	1,721
1977	2,238	1,179	---	---	---
1978	---	---	2,674	---	---

of Tables 1-4 and 1-5 is in the trend toward an increase in the longevity of all ages of the population with time and an increasing trend in the number of persons living to an advanced age (80 and over). These trends are a function of "across the board" advances in medical care within the society. However, while marked progress has been made in slowing the aging process, improvements in the quality of the lives of aged persons have become a pervasive concern and topic of much research.

Work on the regeneration of organs can be classified into two areas:

- **Regrowth**--regenerating lost or destroyed parts of or full organs;

- **Prolongation**--extending or replacing an organ for a longer life span.

Restorative processes for the aged are largely speculative or in the infant stage of development as a by-product of normal advances in medical technology. For example, Alzheimer's disease research is an outgrowth of more general research into the restoration of the brain. Regeneration, through biotechnology and genetic engineering, offers innumerable possibilities for application; current experimentation and research include the grafting of skin for burn victims and nerve regeneration.

The average life expectancy in the U.S. has grown from 54.1 years in 1920 to 74.5 years in 1982, an increase of 27.4%. Further prolongation of life will be derived from advances in technology and medicine, rather than hygiene and basic medical care. By the year 2000, people may live to an average of 100 years.

Health Education and Services

A more subtle health quality indicator is the quality of medical education. Educational requirements for primary medical care personnel in the U.S. and its competitor nations appear to be essentially equivalent. The basic requirement among all the nations examined is 12 to 13 years of primary education, followed by six to eight years of college medicine for physicians and two to four years of college nursing for clinical nurses. An actual measure of the quality of these educational facilities, however, is not available.

The mental attitude and comfort of a hospital patient are additional primary concerns that are a measure of health quality. Hospital services, such as semi-private rooms, the presence of telephones, televisions, access to literature and periodicals, contribute to a positive mental atmosphere for recovery from illness. Such facilities are greatly superior in the U.S. to those available in all other runner-up nations.

Quantity of Available Health Care

The quantity of health care is a measure of its availability to the general population. In the U.S., where 60-70% of surgery is elective, availability is directly, but not exclusively, a function of the ratio of primary health care personnel and general service hospital facilities to the population. The relative utilization of the available facilities by the population reflects the efficiency of the health care system.

Table 1-6 shows the number of primary health care personnel--active physicians and nurses--for the U.S., Japan and Italy. The data provide a measure of the capacity of the primary medical personnel to cover the health needs of the general population. The U.S. commitment of primary personnel to health care coverage clearly exceeds that of Japan and Italy.

TABLE 1-6

NUMBER OF PRACTICING
PRIMARY CARE PERSONNEL, 1980

	U.S.	JAPAN	ITALY
PHYSICIANS/100,000 POPULATION	201	134	115
NURSES/100,000 POPULATION	511	422	321

SOURCES: U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
ANNUARIO STATISTICO ITALIANO
MINISTRY OF HEALTH AND WELFARE, JAPAN

TABLE 1-7

TOTAL NUMBER OF HOSPITALS, HOSPITAL BEDS
AND SHORT-STAY HOSPITALS,[a] 1980

	U.S.	JAPAN	ITALY
TOTAL HOSPITALS/100,000	3	8	3
TOTAL BEDS/100,000	591	1,127	964
SHORT-STAY HOSPITALS/ 100,000	3	7	3
SHORT-STAY BEDS/100,000	474	780	778
OCCUPANCY RATE (%)	75.6	---	69.7

[a] SHORT-STAY HOSPITALS ARE ALL HOSPITALS EXCLUDING TUBERCULOSIS, SANITARIUMS, MENTAL INSTITUTIONS, LEPROSARIUMS AND MAINTENANCE CARE FACILITIES.

SOURCES: U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
ANNUARIO STATISTICO ITALIANO
MINISTRY OF HEALTH AND WELFARE, JAPAN

The number of available hospitals and hospital beds per unit population reflects a society's ability to provide in-depth care for illness and disability. The U.S. posture is at first glance not as good as that of other contemporary nations (see Table 1-7). However, the 76% occupancy rate in U.S., short-stay, general service hospitals in 1980 shows a greater efficiency in using its available facilities.

Productivity

Productivity in health care can be defined as the efficiency with which health care facilities are utilized. In current practice, two types of health care facilities are in use: 1) long-term (extended care) facilities with lengths of stay in excess of 30 days; and 2) short-term, general service facilities with lower average lengths of stay. Extended care facilities, typically sanitariums and leprosariums, constitute a small fraction of all hospital facilities. They generally have low rates of productivity. Most hospital facilities are of the general service type, admitting and discharging large numbers of patients whose length of stay does not exceed days or weeks. A principal statistical cause of low average lengths of stay is the prevalence of maternity cases, which have a high relative frequency and low duration. The productivity of general service hospitals in the U.S., Japan and Italy is shown in Table 1-8.

Average length of stay is the most significant indicator in Table 1-8. The U.S. shows about 35% more productivity than Italy based on this indicator. Longer average lengths of stay indicate the admission of large-numbers of individuals with more serious conditions. Health care experts suggest two possible explanations for the more extended hospital stays in Italy:

- The Italian patient, who is less able to afford his portion of the expense of medical care, delays early visits. This results in longer hospital stays through neglected, aggravated conditions.

TABLE 1-8

NEW ADMISSIONS TO SHORT-STAY
GENERAL SERVICE HOSPITALS, 1980

	U.S.	ITALY	JAPAN[a]
TOTAL ADMISSIONS (MILLION)	38.1	9.9	8.6
PERCENT OF POPULATION	16.8	17.6	7.4
RATE PER 100,000	16,750	17,560	7,360
AVERAGE LENGTH OF STAY (DAYS)	7.8	11.8	37.3[b]
RELATIVE PRODUCTIVITY	1	0.66	0.21

[a] INCLUDES EXTENDED CARE FACILITIES
[b] 1981

SOURCES: U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
ANNUARIO STATISTICO ITALIANO
MINISTRY OF HEALTH AND WELFARE, JAPAN

- The incidences of debilitating diseases (both pathogenic and organic) are significantly higher in Italy vis-a-vis the U.S., see Figures 1-2 through 1-4.

Disease rate is the more likely driver of productivity differences, which would explain the lower length of stay in the U.S. because of the higher availability of treatment and accessibility of care.

Equity of Health Care Distribution

Historically, the responsibility for medical care costs has rested with the individual receiving the care. Within the last 50 years, however, increasingly larger proportions of the cost of health care have been provided by national governments and pri-

vate insurers, a direct result of the philosophy that no individual should be denied medical care. Among industrialized nations this has resulted in a diversity of publically financed or subsidized health care systems tailored to the needs and culture of the sponsoring nation.

In the U.S., federally subsidized health care is reserved for the elderly (persons age 65 and over), or the medically indigent. The medically indigent are defined as those persons or families unable to afford basic or emergency health care. In the U.S., such persons are often defined as falling below some minimum level of income (poverty level). For 1980 in the U.S., the poverty level for an individual was set at $4,190 and for a family of four persons at $8,414. These federally financed health care subsidies for the elderly and the indigent are augmented by mandatory contributions of 1.3% of employee earnings, by both employees and employers.

Most health care financing in the U.S. is provided through some form of private health insurance. Each insurer places some limit on coverage and requires the covered individual to assume a percentage of the cost of health care received.

Personal liability for the cost of health care averages 20%. Private insurance coverage is most often supplied by an individual's employer; use of dependent care options may require the employee to contribute a portion of the cost.

Government-financed health care in Japan and Italy differs from that employed in the U.S. in three significant ways:

1) All persons in Japan and Italy are covered; in the U.S. only persons 65 and over, or those registered medically indigent and their dependents, are covered.

2) The Japanese and Italian systems feature government-subsidized insurance companies for workers in various occupations. In the U.S., insurance companies are nonsubsidized private corporations.

3) Government coverage in Italy and Japan includes all medical conditions including dental. The U.S. coverage excludes dental insurance; private dental insurance in the U.S. is costly and used by only 30% of the population.

Table 1-9 compares the government-financed health care programs for the U.S., Italy and Japan.

Both Italy and Japan require higher contributions from non-government sources such as industry and private persons. In addition, these countries provide incentives in the form of subsidies to recognized insurers, which facilitate the dissemination of medical care to the population.

In each of these countries, two components underline the elimination of disease and connection of handicaps: 1) the actual "bookkeeping" costs saved by increasing the individual productivity or reducing care; and 2) the societal "benefit" placed on improving the health of individuals within the nation. The former, measurable in dollars, is often overshadowed by the latter. The rapid increases in the cost of health-related care in the U.S. signal the need to determine how health care may be delivered more effectively (although quantitative measures of effectiveness are elusive). In 1960, the U.S. spent $39 billion (1972 $) on health care; this cost rose to $82 billion (1972 $) in 1970, and to $139 billion (1972 $) in 1980.

Table 1-10 shows the government expenditures for health care in the U.S., Japan, and Italy. Caution should be used when comparing such data because of the differences in the cost of health

TABLE 1-9

GOVERNMENT PROGRAMS FOR MEDICAL CARE

CHARACTERISTICS	U.S.	JAPAN	ITALY
COVERED POPULATION	1) MEDICAL INDIGENTS 2) PERSONS 65 AND OVER	ALL RESIDENTS	ALL RESIDENTS
GOVERNMENT CONTRIBUTIONS	COST OF ADMINISTRATION AND BALANCE OF MEDICAL EXPENSES	45% OF SUBSIDY TO APPROVED INSURERS AND ADMIN. COSTS [a]	VARIOUS SUBSIDIES[a]
TAX CONTRIBUTIONS			
• EMPLOYER	1.3% OF PAYROLL	4.2% OF PAYROLL	10-15% OF PAYROLL
• EMPLOYEE	1.3% OF EARNINGS	4.2% OF EARNINGS	0.3% OF EARNINGS
COVERAGE	VARIES BY STATE. GENERALLY ALL EXPENSES EXCEPT THE FIRST $200 AND $51 PER DAY FOR 30 DAYS AFTER AN INITIAL 60-DAY PERIOD	ALL MEDICAL SERVICES. PATIENT LIABILITY LIMITED TO 20-30% OF COSTS DEPENDENT UPON CARE RECEIVED	ALL MEDICAL SERVICES. LIABILITY UNKNOWN
DEPENDENTS OF COVERED INDIVIDUAL	DEPENDENT CHILDREN OF THE MEDICALLY INDIGENT	SAME AS COVERED INDIVIDUAL	SAME AS COVERED INDIVIDUAL
ADMINISTERING AGENCIES	DEPARTMENT OF HEALTH AND HUMAN SERVICES	MINISTRY OF HEALTH AND WELFARE	MINISTRY OF LABOR AND SOCIAL WELFARE
	SOCIAL SECURITY ADMINISTRATION	SOCIAL INSURANCE AGENCY	NATIONAL SOCIAL INSURANCE INSTITUTE
	HEALTH CARE FINANCING ADMINISTRATION	NATIONAL HEALTH INSURANCE SOCIETIES (SUBSIDIZED)	

[a] THE JAPANESE GOVERNMENT PROVIDES 45% OF THE FUNDING FOR GOVERNMENT APPROVED PRIVATE INSURANCE COMPANIES AS WELL AS THE COST OF ADMINISTERING INSURANCE BENEFITS. IN ITALY SUBSIDIES VARY WITH THE TYPE OF INSURANCE COMPANY, USUALLY BY OCCUPATION, WITH NO FIXED PERCENTAGE ASSIGNED. IN BOTH COUNTRIES INSURING AGENCIES MUST BE APPROVED BY THE GOVERNMENT TO QUALIFY FOR A SUBSIDY.

SOURCE: U.S. DEPARTMENT OF HEALTH AND HUMAN RESOURCES, RESEARCH REPORT NO. 58.

care within these countries. The significance of Table 1-10 is in the relative distribution in health care expenditures by the three nations. Italy expends almost twice as much of its resources on health care (as a percentage of GNP) as the U.S., yet per capita expenditures are similar. Japan expends a similar portion of its resources, but less per capita than the U.S. or Italy. While per capita expenditures in Italy or Japan cover the entire population, the U.S. expenditures, though expressed as per capita, are confined primarily to the medically indigent and elderly. Thus, while the federal government contributes almost half of the national expenditures for health care in the U.S., the major burden falls on individuals and third party insurers, see Table 1-11. This burden on third party payers and direct payment by individuals in the U.S. implies an inequity based upon one's ability to pay the liability imposed or medical expenses not covered by private insurers.

Table 1-12 illustrates the relative inequity of the U.S. medical care system with regard to socioeconomic group (the ability to pay). The significance of this Table is twofold:

1) Lower family income persons visit physicians more often than their higher income counterparts and tend to utilize outpatient facilities more frequently. This presumably is a result of a perceived lower state of health among lower income groups. The frequency of visits is related to this perceived state of health and perhaps to government financing of the health care for medically indigent families. Higher income groups tend to have "family" physicians; hence the trend toward office visits and phone consultations.

2) Dental costs, with the exception of emergency conditions, are not covered under the U.S. federal health care systems. Table 1-12 shows the correspondence between a low number of dental visits and low socio-

TABLE 1-10

GOVERNMENT EXPENDITURES FOR HEALTH CARE

	U.S.	JAPAN	ITALY
TOTAL EXPENDITURES (1972 MILLION $)	$59,015	$12,718	$12,965
PER CAPITA	$259	$108	$230
AS PERCENT OF GDP	4%	2%	3%
AS PERCENT OF GNP	4%	3.6%	7.3%

SOURCES: U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, 1982
MINISTRY OF HEALTH AND WELFARE FOR JAPAN
ANNUARIO STATISTICO ITALIANO

TABLE 1-11

SOURCES OF PAYMENT FOR
MEDICAL SERVICES IN THE U.S., 1980

	ALL SOURCES	PAYMENT BY INDIVIDUALS	PRIVATE INSURANCE	GOVERNMENT	OTHER
PERCENT OF TOTAL 1950	100.0%	65.6%	9.1%	22.4%	2.9%
PERCENT OF TOTAL 1980	100.0%	32.9%	26.0%	39.7%	1.4%
1980 MILLION $ (CONSTANT 1972 DOLLARS)	122,800	40,420	31,900	48,800	1,700

SOURCE: U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, 1982

TABLE 1-12

PHYSICIAN AND DENTAL VISITS BY SOCIOECONOMIC GROUP

PHYSICIAN VISITS,

FAMILY INCOME	NUMBER OF VISITS/PERSON	PERCENTAGE DISTRIBUTION OF VISITS [a]		
		DOCTORS OFFICE	HOSPITAL OUTPATIENT	TELEPHONE
<$7,000	5.5	58.8	20.7	9.1
$7-9,999	4.4	61.7	16.0	13.8
$10-14,999	4.9	66.1	14.0	13.2
$15-24,999	4.7	70.5	10.8	12.9
>$25,000	4.6	70.6	9.0	14.5

DENTAL VISITS, 1980

DISTRIBUTION OF VISIT FREQUENCY

FAMILY INCOME	NUMBER OF VISITS/PERSON	NEVER VISITED (%)	VISIT INTERVAL <1 YEAR (%)	VISIT INTERVAL >1 YEAR (%)
<$7,000	1.1	14.6	36.7	47.9
$7-9,999	1.2	14.1	38.8	46.5
$10-14,999	1.4	13.8	41.6	44.0
$15-24,999	1.7	10.2	52.2	36.9
>$25,000	2.4	6.5	64.7	28.1

[a] DISTRIBUTION DOES NOT INCLUDE VISITS TO CLINICS OR MEDICAL SCHOOLS OR HOME VISITS BY DOCTORS.

SOURCE: U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

socioeconomic status, which points to an inequity in dental care.

When individuals are liable for a portion of health care costs, those ill-equipped financially will presumably suffer a lack of basic care. As an ameliorative measure, research into medicines that prevent the cause of illnesses may prove to be more fruitful. For example, polio and measles were eventually eradicated by vaccines that prevented these diseases before they occurred. Deterents for tooth decay, infections and many other common health problems have already been developed. Further expansion of current technologies and research efforts could be geared toward eliminating other pathogenic and organic diseases, permanent disabilitators, and the effects of aging.

C.1.2 PRINCIPAL SHORT AND MEDIUM-TERM HEALTH TECHNOLOGIES

The current and short term U.S. posture on health places an increasingly larger emphasis on advanced technologies. Table 1-13 summarizes the technologies currently being introduced into the health care industry. These technologies rely heavily upon microcomputer, laser, drug and new materials advances occurring within the present decade. The technologies of consequence falls into three principal categories:

- Noninvasive diagnostics
- Curative and surgical technologies
- Prosthetics

These categories, with the appropriate technological devices employed, are discussed in the following sections.

Noninvasive Diagnostic Technologies

Short and medium-term diagnostic technologies are centered around improvements in two recently introduced technological aids: computer axial tomography (CAT) and the ultrasound scanner.

TABLE 1-13

PRINCIPAL NEAR AND MEDIUM-TERM TECHNOLOGIES ENTERING THE HEALTH CARE INDUSTRY

TECHNOLOGY	DESCRIPTION
NONINVASIVE DIAGNOSTICS	
• **COMPUTER AXIAL TOMOGRAPHY (CAT, CT)**	COMPUTER ENHANCEMENT OF X-RAY IMAGES PROVIDING BETTER DIAGNOSTIC INFORMATION.
• **NUCLEAR MAGNETIC RESONANCE (NMR)**	ALLOWS TOMOGRAPHIC SCANNING WITHOUT IONIZING RADIATION THEREFORE REDUCING PATIENT RISK. PRODUCES CHEMICAL AS WELL AS DIAGNOSTIC DATA. PRODUCES UNOBSTRUCTED IMAGES IN BOTH CROSS-SECTION AND SAGITTAL PLANE VIEWS.
• **POSITRON EMISSION TOMOGRAPHY (PET)**	DEVELOPED IN THE 1970s. UTILIZES ISOTOPE INJECTION COMBINED WITH COMPUTER ASSISTANCE TO MEASURE AND VISUALIZE HUMAN METABOLISM. IMPROVED VERSIONS CAPABLE OF DETECTING RAPID CHANGES IN METABOLISM.
• **DIGITAL SUBSTRUCTION ANGIOGRAPHIC (CT)**	INCORPORATES FLUOROSCOPY AND ANGIOGRAPHY INTO CT SCANNING TO PROVIDE MORE DIAGNOSTIC INFORMATION IN A SINGLE SCAN.
• **ULTRASOUND SCANNER (US)**	PRODUCES COMPUTER ASSISTED HIGH RESOLUTION, REAL-TIME IMAGES. NEW TECHNIQUES ALLOW DETECTION OF CHANGES IN TISSUE PROPERTIES INDICATING SPECIFIC DISEASES.
• **HELIUM BEAM RADIATION**	CAPABLE OF DELIVERING 8,000RADS TO A TUMOR WITH PRECISIONS SUCH THAT TISSUE 3mm FROM POINT OF FOCUS IS UNAFFECTED.
• **COLD-FIRE LASER SURGERY**	EXCISION OF ABNORMAL GROWTHS, SELF-CAUTERIZATION OF INCISIONS, DESTRUCTION OF CANCEROUS CELLS. ADAPTABLE TO OUTPATIENT TREATMENT. IN ADDITION, PROVIDES A FINER CUTTING LINE, USED NOW AS PHOTOCOAGULATOR FOR REATTACHMENTS OF OPTIC NERVE TO RETINA. ULTRAVIOLET LASERS (UV) OR COLD LASERS DISRUPT THE BINDING CELL ENERGY WITHOUT AFFECTING NEARBY CELLS.
• **MICROWAVE SCALPEL**	HIGH FREQUENCY VERSION OF RADIO FREQUENCY DEVICES WITH LESS CELL DISRUPTION.
• **PUMP APHERESIS**	WILL DRAW, SEPARATE, TREAT, FILTER AND RETURN THE BLOOD. CURRENTLY UNDER RESEARCH WITH APLASTIC ANEMIA AND LUPUS.
• **ENDOSCOPICS**	USING FIBER OPTICS, FOR ILLUMINATION, VIEWING, SALINIZATION, OR FLUID/PARTICLE WITHDRAWAL IN BIOPSY AND MICROSURGERY. REDUCES PERFORMANCE TIME AND COSTS, HOSPITAL STAYS AND LOSS OF WORK TIME.
a) TRANSDUCER HEADS	MEASURE CHEMICAL IMBALANCES, CELLULAR FLUIDS, AND CHEMICAL INDICATORS. WOULD ALLOW PARALLEL ENDOSCOPIC MICROSURGERY AND IMMEDIATE DIAGNOSIS AND REMOVAL OF DISEASED/DAMAGED CELLS. WOULD REDUCE MENTAL/PHYSICAL TRAUMA, DECREASE RISK OF INFECTION, ELIMINATE NEED FOR TRANSFUSIONS, REDUCE HOSPITAL STAYS.

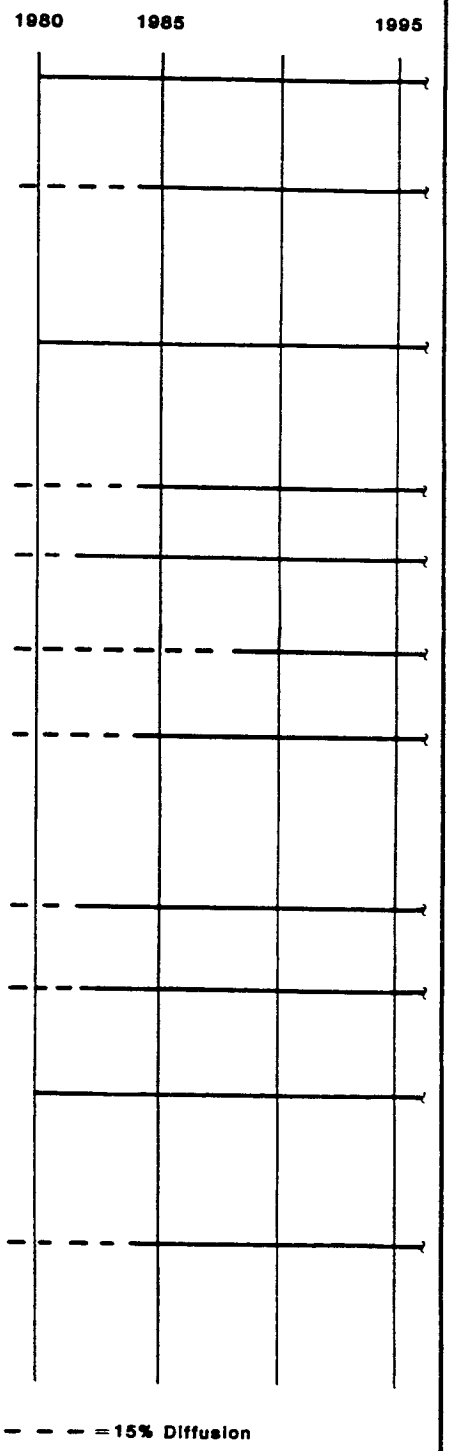
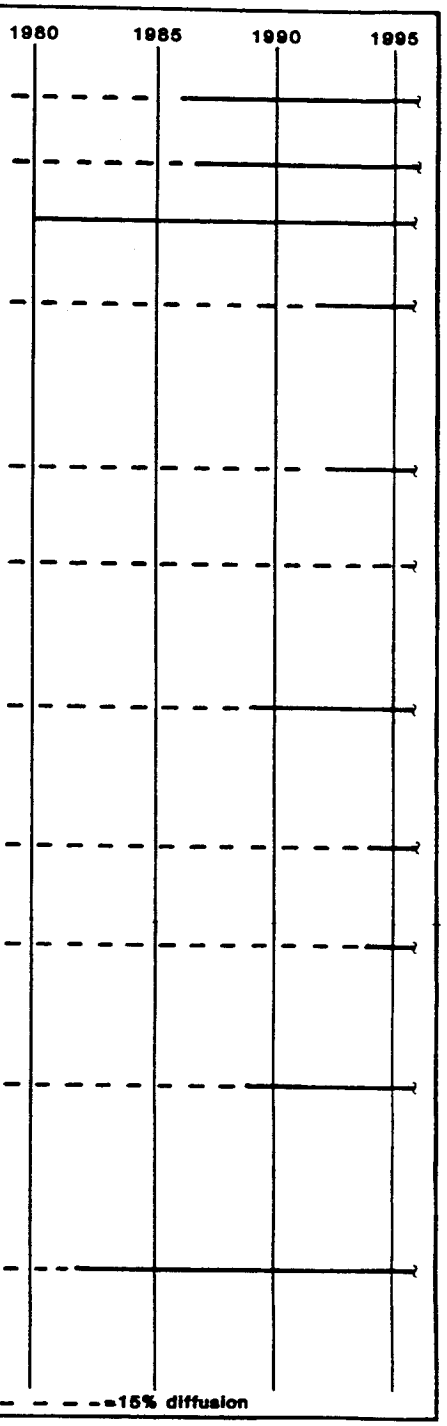


TABLE 1-13 (CONTINUED)

b)	SUTURING HEADS	BIODEGRADABLE SNAPRINGS ATTACHED IN SUTURING HEAD TO "CLAMP" TISSUE TOGETHER.
c)	ADHESIVE AUGMENTED PLASTIC SUTURES	BIODEGRADABLE, AUGMENTS OR SUBSTITUTES FOR PLASTIC SUTURES.
•	INTRA-ARTERY BALLOONS	REDUCES THE NEED TO LIGATE VESSELS OR PROVIDE REPLACEMENT BLOOD.
•	COMPUTERIZED ANESTHESIOLOGY	PROVIDES ANESTHESIA AND ALSO MONITORS VITAL SIGNS, BLOOD GASES, AIRWAY RESISTANCE AND INDUCED GAS CONCENTRATION.
NEW MATERIALS PROSTHESIS		
•	ARTIFICIAL ORGAN TECHNOLOGY— ARTIFICIAL HEART	NEW NONREACTIVE MATERIALS AND DEVELOPMENT OF MINIATURIZED PROPULSION SYSTEMS AND POWER SOURCES.
•	ARTIFICIAL LIMB PROSTHESIS	ADVANCES IN SENSORS, MINIATURE MOTORS, POWER SUPPLIES AND LIGHT ALLOY MATERIALS WILL IMPROVE UTILITY, ALLOW FINE MANIPULATIONS AND PRODUCE AESTHETICALLY ENHANCED PROSTHETICS.
•	ARTIFICIAL SKIN	CHEMICALLY SYNTHESIZED FROM ANIMAL HIDES, PROVIDES AN ORGANIC BUT BIOLOGICALLY INERT COVER FOR BURN VICTIMS. IS ABSORBED BY THE BODY DURING THE HEALING PROCESS. REDUCES SCARRING.
•	ARTIFICIAL BLOOD	TEFLON-BASED WITH AN ARTIFICIAL HEMOGLOBIN, CAN BE USED IN TRANSFUSIONS WITHOUT NECESSITATING CROSS-MATCHING.
•	ARTIFICIAL BODY COMPONENTS	THROUGH GENETIC AND MOLECULAR ENGINEERING. TREATMENTS FOR DEGENERATIVE DISEASES, OSTEOPOROSIS AND REPLACEMENT PROSTHESIS. BY COMPUTER DESIGN, WILL PROMOTE BONY IN-GROWTHS, AND JOINT REMODELING.
•	NEUROMUSCULAR STIMULATORS	REPLICATION OF NERVE CELLS OR SYNTHETIC NERVE CELLS TO COMPLEMENT EXISTING CELLS. IMPLANTATION OF "JUMP WIRES" TO REPAIR FAULTY NEURAL CONDUCTION PATHWAYS (WITH OUTSIDE-BODY POWER SOURCE). TIMING UNITS OR BIOLOGICAL SWITCHES WILL PERIODICALLY POLARIZE THEMSELVES.
•	LIMB TRANSPLANTS	COMBINING JOINT RECONSTRUCTION, NERVE JOINING, BIOCHEMICAL OR DRUG TREATMENT, CLONAL ANTIBODIES, TO ELIMINATE THE NEED FOR PROSTHESIS TO REPLACE LIMBS AND DIGITS.



The benefits derived from these technologies will depend upon cost reduction capability and the level of increased or early diagnostic precision. Though several versions of both devices exist in a few U.S. hospitals, their applications with respect to specific diseases are unclear. The present application of these noninvasive technologies is limited more as a function of data interpretation rather than the limited applicability of the equipment.

As interpretation of the data provided by advanced diagnostics improves, such equipment could replace exploratory surgical procedures. The time frame for such improvements in interpretation will be largely affected by enhanced resolution techniques and the as yet preliminary advances of nuclear magnetic resonance (NMR) tomographers.

The primary advantage of noninvasive diagnostic technology lies in its ability to provide high quality information on a particular disorder, in lieu or in support of a later biopsy. The noninvasive nature of these diagnostic devices permits the pinpointing of tumors or diseased tissue without the risks of infection caused by exploratory surgery. In addition, when surgery is required, noninvasive techniques permit a surgeon to go directly to the affected tissue and avoid the unnecessary contact with adjacent tissues.

Curative and Surgical Technologies

Medical researchers have long sought methods and devices to make surgical procedures more effective and less traumatizing to uninvolved tissues.

Two of the most promising technologies, helium beam radiation and cold fire laser surgery, are presently undergoing experimental treatment testing. These technologies are outlined in Table 1-13. Coupled with advanced diagnostic technology and

improvements in operator and physician-developed methodologies, these technologies may be expected to dominate cancer surgery and tumor therapy by the mid 1990s. The benefit of helium beam technology is in its ability to deliver high levels of radiation to an extremely small area, as opposed to current technologies that require generalized radiation exposure and increased patient risk. Cold fire laser surgery, transmitted through fiber optics, has the benefit of vaporizing cancerous cells and leaving no residue promoting metastasis. This process substantially reduces the risk of recurrences.

The curative technologies of the greatest interest are those which either facilitate blood cleansing operations or reduce the necessity for return visits to hospitals after surgical procedures. These technologies are briefly summarized in Table 1-13.

Pump technologies show great promise for miniaturization. A miniaturized pump device could then be implanted and accommodate continuous site specific chemotherapy, hormone delivery or sustained release of supplementary enzyme. This device could greatly reduce the need for daily insulin injections by diabetics or the side-effects produced in chemotherapy cancer patients resulting from the present need to treat the whole body rather than a specific cancerous site.

Endoscopics show promise in reducing the size of incisions and the magnitude of biopsy operations. Through the use of fiber optics for illumination and site viewing, microincisions are possible. The advantages to the patient are in a less debilitating biopsy surgery. Smaller exploratory operations may also lead to cost reductions and efficiency increases.

Computers may be eventually utilized to monitor a patient's vital signs and administer anesthesia as required during routine operations. Such a device could cut medical costs by removing the need for an anesthestist and enhancing the accuracy of anesthesia through continuous monitoring.

Prosthetics

Prosthetic technology has been evolving in the health care industry for many years. In ancient times prosthesis was limited to "peg legs," hooks for hands, crutches and wheelchairs or litters. Today, prosthetic technology includes artificial limbs, hearing aids, and motorized wheelchairs. Many new prosthetic devices have recently undergone initial experimental testing; a brief list is provided in Table 1-13. Prosthesis, as is shown in Table 1-13, now includes artifical organs, skin and blood. While promising technologies are emerging and continually being incorporated into all types of prosthesis, constraints by government agencies on human experimentation tend to slow development of all but whole or partial limb prosthesis.

A constraint limiting to industrial investment in such new technologies is the indirect cost of such technology. A large variety of products, drugs and devices are subject to Food and Drug Administration regulations. Approval of such medical devices entails two major testing stages which require seven to ten years to complete. Costs for testing and approval under this system average $53 million per day industry wide.

The first stage of the certification process requires submission of test data from industry research, which proves the device, drug or equipment is safe and beneficial to humans. Upon approval, the FDA will then require a period of clinical testing that progressively increases the sample population. A detailed report is then submitted for rebuttal. If the report is approved, the manufacturers are subjected to a subsequent rigid reporting schedule consisting of:

- quarterly reports for the first year,
- semiannual reports for the second year,
- annual reports for the duration of the marketing drug or the of the device.

Government research efforts and partnerships with industry and research institutions partially compensate for these costs.

The degree of improvement that the technologies depicted in Table 1-12 will make on the health quality in the U.S. is largely speculative. Key factors are: 1) how rapidly drugs and devices are approved; 2) how extensively utilization of such technologies filters through the health industry; 3) how cost-effective they will be, and 4) how they perform in their target populations.

C.1.3 SUMMARY AND CONCLUSIONS

The state of health care in the U.S. can be regarded in a generally positive light. The availability of care, quantity of facilities, care personnel and financing of health care in relation to other developed countries appear satisfactory. Equitable distribution of care continues to be a problem which can be improved only through health cost reductions and higher rates of productivity.

Generally, health and health care delivery show substantial improvement over time in the U.S. and are comparable with other developed nations. However, measurements of efficiency are still primitive and require further fundamental investigations to better understand the value, both tangible and intangible, of funds in health-related activity at the margin of investment.

Given the significant increase in health care costs as a share of disposable national wealth, identification of potentially efficient technologies meeting health-enhancing requirements is appropriate even in the absence of adequate measures of effectiveness.

Current applications of electronics, robotics, biotechnology, medicine, artificial intelligence, and information rationalization can and are being used and manipulated for further diagnosis, care, and treatment. These applications allow a

person to walk, talk, move and manipulate objects in normal, day-to-day activities without being labeled "disabled" or a "freak."

Heart transplants have established the precedent for all other organ transplants. National networks or organ banks attempt to provide cross matches presently needed for surgery of hearts and kidneys. New medicines to prevent rejection and the development of artificial organs through known technologies make the likelihood of transplants for every organ possible without relying on human organs.

Electronic stimulation, nerve regeneration/restoration, and micro or laser surgery combined raise the possibility for the full restoration of senses by artificial means. Artificial eyes allow one to see dimensions, characteristics, shapes and movements; further advances will facilitate the perception of color and "real pictures" besides graphics. Artifical ears, more sensitive than hearing aids, will not only allow audio but fine tuned or expanded hearing ranges. The sense of touch can be restored to include texture; the sense of smell to distinguish acute variances in odors.

Each of these prosthetic techniques--artifical organs, and artificial senses--is a by-product of advances made in biotechnology and medical technologies, which are discussed in Sections E.5 and E.6. They are enhanced by applications of Artificial Intelligence, discussed in Section E.3.

C.2 SECURITY

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C.2.1 INTRODUCTION

Security is the freedom from danger, fear, anxiety, want or deprivation. The desire for security manifests itself in three major aspirations:

- Prevention of man-made violence;
- Alleviation of naturally-induced violence;
- Protection against financial deprivation.

The Constitution of the U.S. uses the term "tranquility" to designate the people's aspiration for protection from man-induced causes of violence.

Communities and states have traditionally sought to protect their constituency from the effects of deleterious natural events as well. Jefferson implied this in his statement that one of the government's jobs is the "erection of lighthouses." As the growing standard of living in this country allowed ever-increasing protection, the aspiration of "protection from untoward natural events" became the principal objective of such agencies as the Corps of Engineers, NOAA, the USDA's Forest Service, FEMA, and state and local governments.

Similarly, mankind has always aspired to financial security. The fulfillment of this desire was made possible by the growth in wealth resulting from the industrial revolution. It is currently a major function of all governments, including the U.S.

The classification in Figure 2-1 segments societal security aspirations into its principal elements. It is especially constructed to draw upon and to reconcile methodologies employed by the U.S. and principal international agencies, e.g., Interpol, FBI, OECD, etc. Note that under "Conflict," the element labeled "International" subsumes military activities which have been excluded from this analysis.

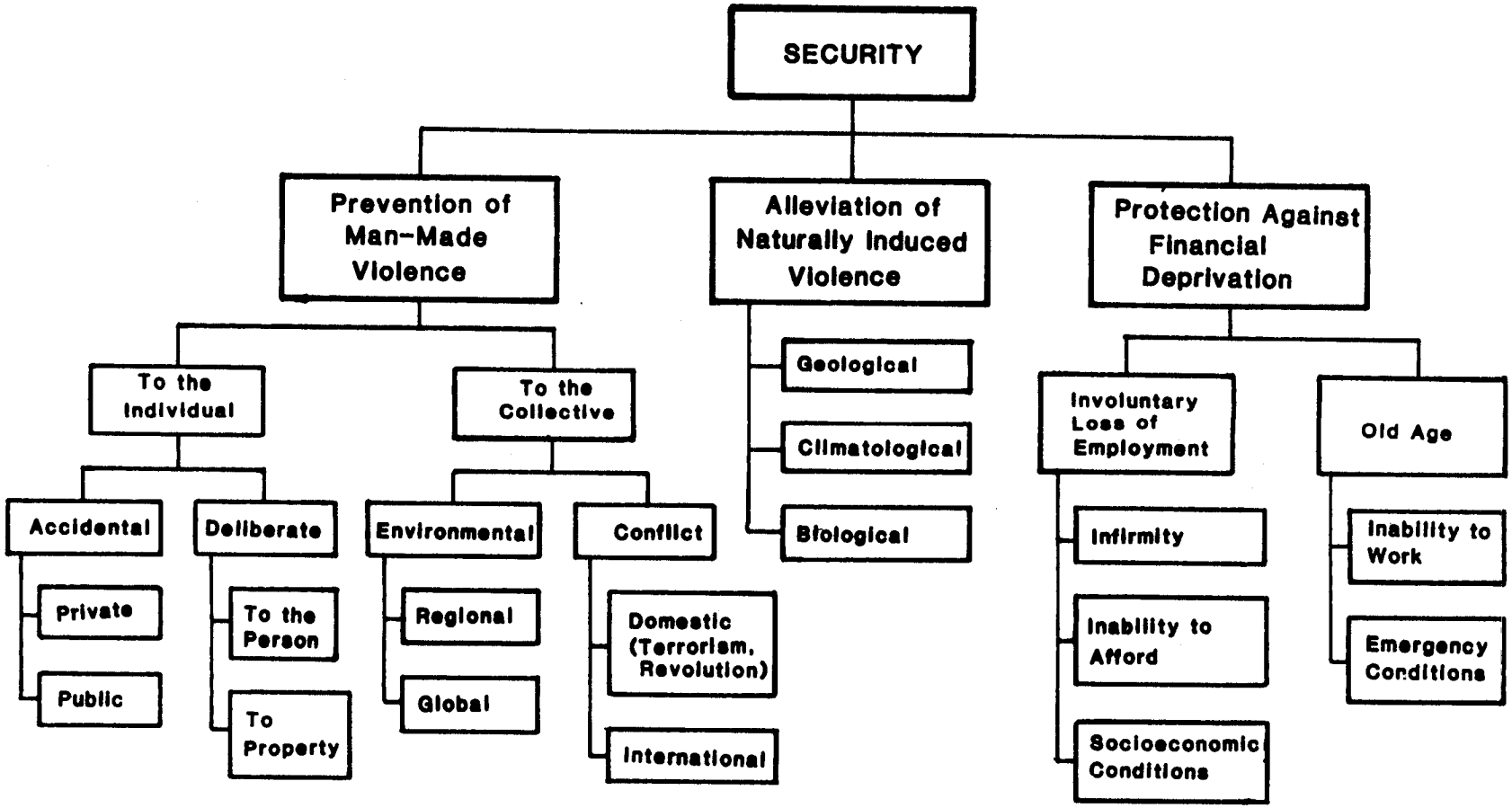


Figure 2-1. Structure of the "Security" Aspirations

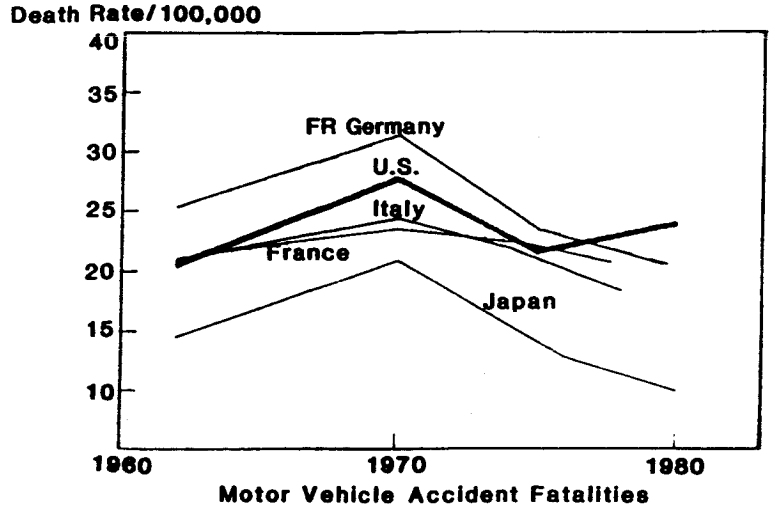
The categories shown in Figure 2-1 will be discussed in the following sections. Section C.2.2 presents the indicators for intentional as well as unintentional forms of man-made violence to the individual. In Section C.2.3 man-made violence to the collective society, expressed as threats from damage to the environment, is presented from both a regional and global perspective; the natural violence component of Figure 2-1 is also presented in Section C.2.4. Finally, in Section C.2.5 the efforts of each country to protect the individual against financial deprivation are examined.

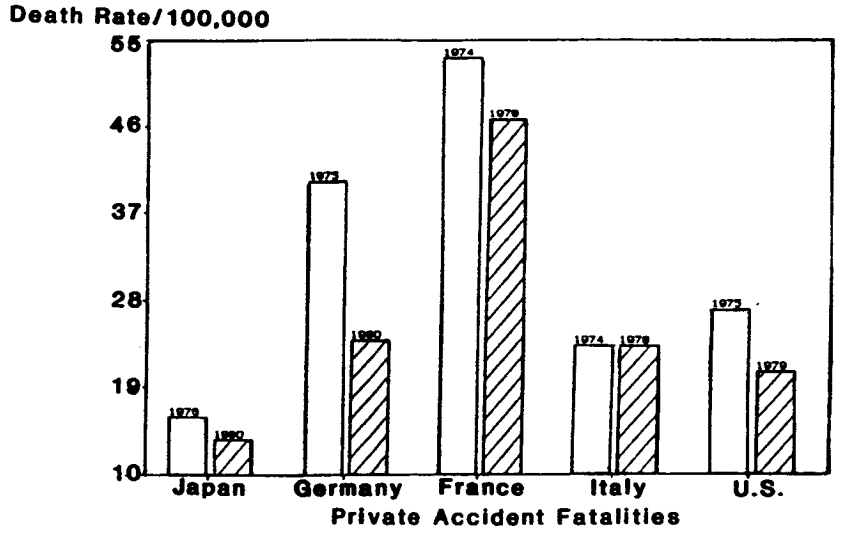
C.2.2 MAN-MADE VIOLENCE TO THE INDIVIDUAL

With reference to Figure 2-1, man-made violence to the individual resolves into four categories:

- Private-home accidents, drownings, fires, poisonings;
- Accidental public-motor vehicle, transportation;
- Deliberate to the person-violent crime;
- Deliberate to property-property crime.

Comparative trends of accidental violence are portrayed in Figure 2-2. (The data in Figure 2-2 are not strictly comparable because of the crime classification differences among the countries depicted.) Motor vehicle and private accidental violence shows a decreasing trend for the countries considered. However, when comparing these two categories, motor vehicles account for over 50% of total accidental deaths in all countries, except France which has an exceptionally high private accident rate. Japan has the lowest private accident rate, with the U.S. having the second lowest. In all countries, motor vehicle fatality rates peaked in 1970 and then declined; however, motor vehicle accidents still comprise the large portion of accidental violence.





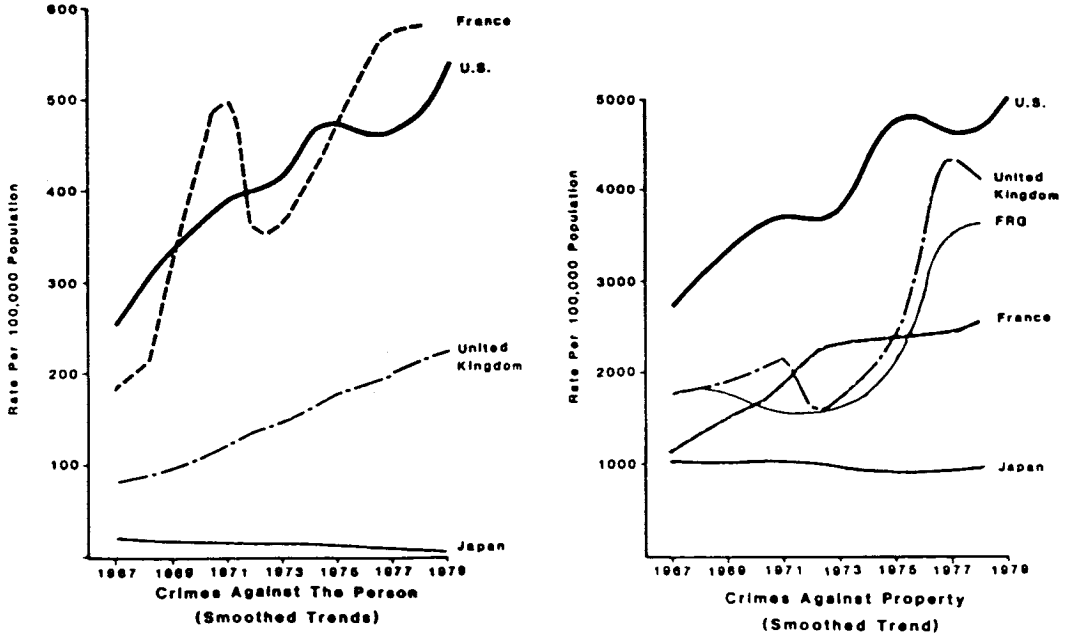


Figure 2-2. Comparative Trends of Man-Made Violence

Deliberate violence takes two forms, crimes against the person (violent crime) and against property (property crime). The following definitions of deliberate violence are based upon the FBI crime index:

- **Violent Crime**--Includes homicide and non-negligent manslaughter, rape, robbery and aggravated assault;

- **Property Crime**--Includes burglary, larceny-theft, motor vehicle theft and arson.

Figure 2-2 also depicts historical crime rates for various countries. Each of these developed countries, except for Japan, shows an almost exponential increase in both violent personal and property crimes. Japan, with the lowest rate of increase, and Italy, with an intermediate rate, will be used for comparative purposes, vis-a-vis the U.S., in this analysis. The extent of the problem will be measured in terms of three indices--quantity, productivity and quality as defined below.

- **Quantity**--The total number of offenses known to the police, arrests by crime, violent and property crime as a percent of total arrests, and percentage of "index" crimes and number of juveniles arrested by crime category;

- **Productivity**--The number of reported cases cleared by arrest, number of defendants processed by courts;

- **Quality**--The number of correctional facilities, age of prisons, the number of inmates and extent of over-crowding. The educational requirements for police officers, number of police officers per 100,000 population.

Quantity

A specific breakdown of criminal activity, based upon the eight FBI crime index categories, is presented in Table 2-1. The Table demonstrates that the overall U.S. crime rate is significantly higher than Japan and Italy. For all three countries incidences and arrests for property crimes are much higher than for violent crimes. Within these crime categories, aggravated assault is the most frequently reported violent crime. Larceny-theft is the major property crime reported by the U.S. and Japan, while burglary is the only property crime reported by Italy.

As in Figure 2-2, comparative data in Table 2-1 account for the different ways in which each country defines a crime. For example, neither Japan nor Italy reports separate auto theft statistics; and although the U.S. crime rate is higher than the crime rates in Japan and Italy, the rates of the three countries are similar in terms of the proportion of offenses reported and arrests made.

Another measure of quantity is the percent of crimes committed by juveniles (persons under 18), see Table 2-2. In the U.S., juveniles accounted for 21% of all arrests and 40% of the arrests for property crimes in 1980. In Japan, juveniles account for a higher percentage of arrests by type of crime than in the U.S. or Italy. Again property crime arrests exceed those for violent crime among juveniles in these countries. In the U.S. robbery is the primary violent crime arrest; in Japan it is assault; and in Italy it is rape. Burglary and arson are the highest property crimes in the U.S.; larceny-theft is the highest in Japan.

In summary, property crime appears to be the major crime type committed in all countries. The U.S. has a much higher overall crime rate than Japan or Italy, though the proportion of

TABLE 2-1

CRIMINAL ACTIVITY BREAKDOWN

CRIMINAL OFFENSES KNOWN TO THE POLICE PER 100,000

	U.S. 1980[a]	JAPAN 1980[b]	ITALY 1981[d]
HOMICIDE	10.33	1.43	11.84
RAPE	36.74	2.21	2.31
ROBBERY	252.87	(c)	(c)
AGGRAVATED ASSAULT	297.33	35.34	67.34
TOTAL VIOLENT CRIME	597.27	40.87	210.31
BURGLARY	1,687.25	1.9	2,383.82
LARCENY-THEFT	3,207.78	991.16	—
MOTOR VEHICLE THEFT	508.26	—	—
ARSON	—	1.71	—
TOTAL PROPERTY CRIME	5,403.29	994.77	2,383.82
TOTAL KNOWN CRIME	6,000.56	1,035.64	3,359.5

ARRESTS PER 100,000 BY TYPE OF CRIME, 1980

	U.S.	JAPAN	ITALY
HOMICIDE	9.0	1.32	12.86
RAPE	14.1	2.26	2.29
ROBBERY	67.0	(c)	(c)
AGGRAVATED ASSAULT	124.3	47.87	68.63
TOTAL VIOLENT CRIME	214.4	51.45	83.78
BURGLARY	230.4	1.75	152.9
LARCENY-THEFT	539.8	211.21	—
MOTOR VEHICLE THEFT	62.3	—	—
ARSON	8.9	0.8	—
TOTAL PROPERTY CRIME	841.4	213.76	152.9
TOTAL KNOWN CRIME	1055.8	265.21	236.68

VIOLENT CRIMES VS. PROPERTY CRIME AS % OF TOTAL "INDEX CRIMES"

	U.S. 1980	JAPAN 1980	ITALY 1981
VIOLENT CRIME	20.31	3.77	3.31
PROPERTY CRIME	79.69	96.23	96.69

— INDICATES DATA NOT AVAILABLE

[a] FOR U.S. "OFFENSES KNOWN TO THE POLICE" ARE REPORTED FOR THE SEVEN INDEX CRIMES LISTED, ARSON DATA WERE NOT AVAILABLE.

[b] FOR JAPAN, "GENERAL OFFENSES UNDER CRIMINAL LAWS," EXCLUDES OCCUPATIONAL NEGLIGENCE CAUSING DEATH OR BODILY INJURY (TRAFFIC).

[c] JAPAN AND ITALY DO NOT MAKE A CLEAR DISTINCTION BETWEEN ROBBERY AND BURGLARY; THEREFORE, BOTH ARE LISTED UNDER BURGLARY AS PROPERTY CRIME.

[d] TOTALS INCLUDE ITEMS NOT SEPARATELY IDENTIFIED

SOURCES: U.S. DEPARTMENT OF JUSTICE:
SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1982
JAPANESE STATISTICAL YEARBOOK, 1983
ITALIAN STATISTICAL YEARBOOK, 1983

TABLE 2-2

NUMBER AND PERCENT
OF JUVENILES ARRESTED, 1980

	U.S.		JAPAN		ITALY	
HOMICIDE	1,742	9.3%	29	1.7%	159	2.2%
RAPE	4,346	14.8%	622	23.4%	81	6.26%
ROBBERY	41,997	30.1%	(a)	(a)	(a)	(a)
ARMED ASSAULT	38,135	14.7%	15,426	27.6%	1,066	2.76%
TOTAL VIOLENT CRIME	86,220	19.3%	16,077	26.66%	1,306	2.8%
BURGLARY	215,387	44.9%	551	25.9%	10,248	11.9%
LARCENCY/THEFT	421,082	37.5%	180,723	67.7%	—	—
MOTOR VEHICLE THEFT	58,798	43.3%	—	—	—	—
ARSON	8,161	44.2%	465	45.4%	—	—
TOTAL PROPERTY CRIME	703,428	40.2%	181,739	67.6%	10,248	11.9%

[a] FOR JAPAN AND ITALY, AS PREVIOUSLY NOTED, ROBBERY AND BURGLARY LISTED UNDER BURGLARY.

SOURCES: U.S. DEPARTMENT OF JUSTICE: SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1982
JAPANESE AND ITALIAN STATISTICAL YEARBOOKS, 1983

arrests by offense is similar. For all countries, a large percentage of property crimes are committed by persons under 18.

Productivity

Table 2-3 presents data for the number of cases cleared by arrest for the U.S. and Japan. These comparisons of reported offenses vis-a-vis arrests do not accommodate cases where individuals are responsible for multiple offenses or a number of individuals are responsible for a single offense.

Japan appears to be much more efficient in solving both violent and property crimes than the U.S.; however, both countries show a large number of unsolved (cases not cleared) property crimes, see Table 2-3.

A second corroborative indicator of productivity is the number of cases processed through the courts each year, see Table 2-4. The U.S. total includes only one type of case in one type of court; Italy includes all cases in all lower courts. While Japan appears to be much more efficient in the processing of defendents than the U.S. or Italy, this reflects proceedings at a very low level (the public prosecutors office) and it includes suspended cases, about 37% of which were transferred and relegated to unidentified judicial handling.

Three factors help to mitigate this relatively poor U.S. criminal justice posture. First, in the U.S. defendants have a right to a jury trial, and selecting a jury can be a lengthy procedure. Second, most U.S. criminal cases are disposed of in six months or less, except in chronically delayed state courts, according to the Justice Department publication A Report of the Nation on Crime and Justice. Third, as can be seen in Table 2-5, most cases prosecuted result in conviction. This indicates that most cases are well-reviewed and dealt with at a lower level, without wasted court time on weakly documented evidence.

TABLE 2-3

PERCENT CASES CLEARED, BY ARREST, 1980[a]

	U.S.	JAPAN
HOMICIDE	72.3	97.2
RAPE	48.8	89.3
ROBBERY	23.8	(SEE BURGLARY)
AGGRAVATED ASSAULT	58.7	93.6
TOTAL VIOLENT CRIME	43.6	93.4
BURGLARY	14.2	75.5
LARCENY/THEFT	18.17	55.0
MOTOR VEHICLE THEFT	14.3	N/A
ARSON	N/A	87.9
TOTAL PROPERTY CRIME	16.5	55.1

[a] FOR U.S. THIS MEANS THAT 1) AT LEAST ONE PERSON ARRESTED, CHARGED AND TURNED OVER FOR PROSECUTION 2) OFFENDER DIES OR CONFESSES OR IS PROSECUTED FOR LESS SERIOUS CHARGE. ALSO INCLUDES JUVENILES RELEASED TO PARENTS RATHER THAN PROSECUTED.

SOURCES: U.S. DEPARTMENT OF JUSTICE: SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1982
JAPANESE AND ITALIAN STATISTICAL YEARBOOKS, 1983

TABLE 2-4

CASES RECEIVED, DISPOSED AND PENDING, 1980

	# RECEIVED	# DISPOSED OF	% PENDING
U.S.[a]	44,045	29,297	33.5%
JAPAN[b]	4,083,000	4,061,000	0.54%
ITALY[c]	5,799,784	5,666,747	26.2%

[a] DATA FOR U.S. BASED ON CRIMINAL CASES IN U.S. DISTRICT COURTS.

[b] DATA FOR JAPAN BASED ON CRIMINAL CASES HANDLED AT THE PUBLIC PROSECUTORS OFFICE THROUGHOUT THE COUNTRY.

[c] DATA FOR ITALY BASED ON TOTAL PENAL PROCEDURES HANDLED BY THE LOWER COURTS, EXCLUDING APPELLATE COURTS.

SOURCES: U.S. DEPARTMENT OF JUSTICE: SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1982;
JAPANESE AND ITALIAN STATISTICAL YEARBOOKS, 1983

TABLE 2-5

NUMBER OF DEFENDANTS
DISPOSED OF IN U.S. DISTRICT COURT 1980

TOTAL DEFENDANTS	NOT CONVICTED	CONVICTED AND SENTENCED
36,560	8,259 (21.8%)	29,868 (78.2%)

SOURCES: U.S. DEPARTMENT OF JUSTICE: SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1982

TABLE 2-6

NUMBER OF INMATES IN PRISONS
AND JUVENILE REFORMATORY INSTITUTIONS
AND RATE OF INCARCERATION, 1980

	PRISONS	REFORMATORIES	INCARCERATION
U.S.	26,553 (84.3%)	49,004 (15.7%)	119/100,000
JAPAN	50,984 (93.5%)	3,552 (6.5%)	47/100,000
ITALY	28,058 (100%)[a]	—	501/100,000

[a] INCLUDES BOTH PRISON AND REFORMATORY FIGURES

SOURCES: U.S. DEPARTMENT OF JUSTICE: SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1982
JAPAN STATISTICAL YEARBOOK, 1983
ITALIAN STATISTICAL YEARBOOK, 1983

Quality

Indicators of quality for the criminal justice system concentrate on the rate of criminal incarceration in prison, not on the equitable processing of these criminals. Table 2-6 provides a comparison of the criminal incarceration in these countries.

The lower number of inmates in Japanese prisons reflects its lower crime rate. There are fewer facilities for juveniles in Japan despite the high rate of juvenile crimes; whether this is because they are less frequently incarcerated, or are put into adult prisons, cannot be ascertained from the limited data.

There were 568 adult correctional facilities in the U.S. in 1979; of this total, 559 were state and federal facilities as described in Table 2-7. At present no foreign data on correctional facilities are available.

Maximum security prisons accounted for 27% of all U.S. prisons in 1978; 52% of all inmates were held in these prisons in 1979. Most maximum security prisons hold less than 500 inmates and over half are less than 35 years old. The majority of units within these facilities are designed for single person occupancy; however, both single and multiperson units are extremely overcrowded.

Another indicator of criminal justice quality is the size and educational requirements of a country's police force. In 1977 there were 2.5 police officers per 1,000 residents worldwide, with 80% of all countries having one to three officers per 1,000 residents. Requirements within the U.S. for police officers vary from state-to-state and even within jurisdictions. According to the National Association of State Directors of Law Enforcement Training, the minimum educational requirements are a highschool diploma, or graduational equivalency degree (GED), with the length of police academy training varying between 140

TABLE 2-7

STATE AND FEDERAL
ADULT CORRECTIONAL FACILITIES,[a] (1978)
EXTENT OF OVERCROWDING[b] (1979)

	SECURITY CLASSIFICATION			
	MAXIMUM	MEDIUM	MINIMUM	TOTAL
NUMBER OF FACILITIES	153	224	182	559

	SIZE (BY NUMBER OF PRISONERS)			
	SMALL (<500)	MEDIUM (500-999)	LARGE (1,000 +)	TOTAL
NUMBER OF FACILITIES	376	98	85	559

	BEFORE 1875	1875-1949	1950-1978
DATE CONSTRUCTED	25	220	314

	ONE-PERSON	MULTI-PERSON	DORMITORIES	DATA N/A
NUMBER OF UNITS	128,282	12,852	8,254	714
PERCENT OVERCROWDED	58%	90%	20%	

[a] INCLUDES ONLY THOSE FACILITIES HOLDING PERSONS 24 HOURS A DAY. EXCLUDES COMMUNITY BASED FACILITIES, THOSE UNDER DOD OR INDIAN JURISDICTION OR POLICE LOCKUPS HOLDING PERSONS LESS THAN 48 HOURS.

[b] BASED ON A SURVEY OF STATE CORRECTIONAL FACILITIES CONDUCTED BY THE U.S. CENSUS BUREAU. A UNIT WAS DESIGNATED OVERCROWDED IF IT WAS SMALLER THAN 60 SQUARE FEET OR PROVIDED LESS THAN 60 SQUARE FEET OF FLOOR SPACE PER INMATE. DUE TO METHODOLOGY USED MAY RESULT IN A SLIGHT OVERSTATING OF THE NUMBER OF OVERCROWDED UNITS.

SOURCE: U.S. DEPARTMENT OF JUSTICE: SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS, 1982

hours to 480 hours, 200 hours being a rough average. There are 675 certified law enforcement training academies, while other private, uncertified academies exist and are similar to those accredited. In some cases college and university criminal justice training will substitute for formal academy training, although some indoctrination courses may be required for new officers.

Principal Short and Long-Term Technologies

Reforms need to be focused on the reduction, prevention or elimination of crimes. Technologies supporting the prevention and, hence, reduction of crime are presented below.

An immediate and long-term technology program for improving physical security concentrates on the perfection and advancement of current and near-term measures. Table 2-8 summarizes the current technologies pursued by law enforcement and security organizations.

New developments in technology and community cooperation are being adopted by law enforcement agencies to increase the efficiency of their operations. Advances in electronics, communications, scientific observation and forensic science, are being researched, and renewed public concern for health, safety and the environment are being adapted for integration by national law enforcement organizations.

As a rule, as society extends its security awareness and responsibilities, law enforcement efficiency increases. However, the boundaries of law enforcement authority and responsibility are not clearly defined. Legal and community efforts are impelling businesses and business managers to assume more and more responsibility for the security of their operations and facilities. By the year 2000 it is predicted that businesses will be expected to assume full legal and financial responsibility for their employees and the security of their facilities.

TABLE 2-8

PRINCIPAL TECHNOLOGICAL DEVELOPMENTS FOR INDIVIDUAL AND COMMERCIAL SECURITY

TECHNOLOGY	DESCRIPTION
DETECTION TECHNOLOGY	
• AEROSOL SPRAYS	CARRIED ON A PERSON OR OBJECT. A DETONATION SYSTEM TRIGGERS A SPRAY WITH A FOUL SEMIPERMANENT ODOR ON THE ASSAILANT, ODOR CAN ONLY BE NEUTRALIZED BY SPECIAL ANTIDOTES.
• ENVIRONMENTAL CONTROL UNITS	TO REGULATE ENVIRONMENTAL CONDITIONS OF A POPULATED FACILITY OR HOME. THE BIOLOGICAL MAKEUP OF EACH ENTRANT IS ANALYZED; INTRUDERS AND NON-APPROVED PERSONS ACTIVATE SECURITY SYSTEMS AND ALARMS. DIFFERENT STANDARDS CAN BE SET FOR DIFFERENT TIMES OF DAY.
• AUDIO MEMORIZERS	INSTANT RECALL OF EMERGENCY COMMUNICATIONS TO ASSIST IN APPREHENSION OR INVESTIGATION.
• EXPLOSIVE TAGGING COMPOUNDS	THE "TAGGING" OF EXPLOSIVES WITH IDENTIFYING MATERIALS. AFTER DETONATION THE TAGGING COMPOUNDS IDENTIFY THE MAKE, MANUFACTURER AND OTHER FACTORS.
• BEHAVORIAL PATTERN RECOGNITION	USING COMBINATIONS OF PSYCHOLOGY, SOCIOLOGY, CRIMINOLOGY AND POLITICAL SCIENCES, TO PREDETERMINE OR RECOGNIZE SIMPLISTIC CHARACTERISTICS OF CRIMINALS IN VARIOUS "COMMON" OR "OUTRAGEOUS" CRIMES. IT IS HOPED TO PREVENT ACCESS TO POTENTIAL CRIME AREAS OR TO DETERMINE THE TYPE OF PERSON(S) THAT COMMITS A CRIME BY INTERPRETING THE EVIDENCE, AND APPLYING THE INFORMATION, BY DEDUCTION, IN ORDER TO NARROW OR DIRECT THE INVESTIGATION.
• AERIAL SURVEILLANCE	THE USE OF BALLOONS, BLIMPS AND LIGHTER-THAN-AIR AIRCRAFT, EITHER UNMANNED OR MANNED, TO COVER LARGE, OPEN FACILITIES TO DETECT MOVEMENT OR UNUSUAL EVENTS. THESE CAN ALSO BE USED FOR QUICK RESPONSE TO ANY INCIDENT OR QUICK RETREAT IF NEEDED.
• CAMERA SURVEILLANCE	USE OF REGULAR OR INFRARED CAMERAS FOR DETECTION AND SECURITY, EITHER FOR CONSTANT MONITORING OR ALARM TRIPPED DETECTION. WITH A POTENTIAL OF 83 TELEVISION CHANNELS AVAILABLE JURISDICTIONS UTILIZING EXCESS CHANNELS CAN PROVIDE SECURITY AS WELL AS CONTROL PUBLIC SCHOOL ENTRY/EXIT, TRAFFIC PATTERNS, SPECIAL EVENTS AND GENERAL ACCESS. ALSO TO BE USED FOR RUMOR CONTROL AND PUBLIC INFORMATION.
• HIGH RESOLUTION/ LUMINOUS NIGHT VISION EQUIPMENT	FOR USE DURING TIMES OF LOW VISIBILITY FOR SURVEILLANCE OR SEARCH.
• HAND-HELD RADIATION DETECTORS	FOR DRUG AND CHEMICAL DETECTION IN AUTOMOBILES, OR AIRCRAFT BY DENSITY ANALYSIS; NOT SAFE FOR DRUG CARRYING PERSON.
• PORTABLE LASER FINGERPRINT	CRIME SCENE APPLICATION OF LASERS TO DETECTION SYSTEMS TO DETECT LATENT PRINTS.
• COMPUTERS	UTILIZED FOR RAPID SEARCH OF INFORMATION; AUDIO MEMORIZERS, QUICK VERIFICATION OR REPLAY OF CALLS FOR HELP; FREEING OFFICERS FOR THE FIELD.
• AUTOMATED DIGITAL AUDIO PROCESSOR	CLARIFIES VOICES BY FILTERING BACKGROUND NOISES FOR ANALYSIS IN CONJUNCTION WITH CRIMES SUCH AS KIDNAPPINGS OR BOMB THREATS.
• VIDEO DOCUMENT ANALYSIS	DETECTS ALTERATIONS TO, REPLACEMENT OF, OR SECRET NOTATIONS TO DOCUMENTS IN AUTHENTICATING, FORGERY OR TAMPERING.
• VOICE PRINTING	FOR IDENTIFICATION AND FILES RECORDING SIMILAR TO FINGER-PRINTING, FOOTPRINTING OR RETINAL SCANNING.

TABLE 2-8 (CONTINUED)

• NEUTRON BACKSCATTER	SHOOTS BEAMS OF RADIATION AT CARS, BOATS AND PLANES; MEASURES ABSORPTION AND DEFLECTION OF MATERIALS FOR DRUG DETECTION.
• SPECIAL MOBILE AUTOMATED REMOTE TERMINAL (SMART) CAR	COMPUTERIZED PATROL CARS CONTAINING TERMINALS, LOGIC UNITS, REGULAR VOICE SCRAMBLE/DECODE AND DIRECT VOICE TRANSMITTERS FOR SITUATION ANALYSIS, VEHICLE IDENTIFICATION AND COMMUNICATIONS. DESIGN FEATURES LARGER INTERIORS, LIGHTWEIGHT ARMOR, AUTOMATIC BRAKING AND PERFORMANCE READOUTS, AND LIFETIME LUBRICATION.
ENFORCEMENT	
• ROBOTICS	MECHANICAL ROBOTS DESIGNED FOR A VARIETY OF PURPOSES
1) SECURITY PATROLS	ROBOTS EQUIPPED WITH SENSORS, CAMERAS AND OTHER DETECTION DEVICES. ABLE TO ENTER AREAS OF HIGH SECURITY, HIGH VIOLENCE OR HARMFUL TO HUMANS; CAN DETECT INTRUDERS OR DISARM CRIMINALS WITHOUT CAUSING A LIFE-THREATENING SITUATION TO UNIFORMED SECURITY INDIVIDUALS.
2) REMOTE CONTROLLED	USED FOR BOMB LOCATION AND DEFUSING; FACILITY ANALYSIS, ENTRY INTO AREAS FILLED WITH VOLATILE OR GASEOUS SUBSTANCES, RECONNAISSANCE, RESCUE, HOSTAGE NEGOTIATIONS.
• 2-WAY SMALL COMMUNICATIONS RADIO	EITHER WRIST BANDS OR MOUNTED INTO HELMETS WITH VISUAL DISPLAY.
• GAS OPERATED PISTOLS	UNDER CURRENT TESTING, NOT FINANCIALLY FEASIBLE OR SAFE; EXPECTED IN THE NEXT TEN TO 15 YEARS.
• HELMETS	LIGHTWEIGHT ALL PURPOSE PLASTIC FOR MULTIWEAR USE. WILL INCLUDE COMMUNICATIONS, GAS MASKS, VISORS AND POSSIBLY TINTED OR INFRARED LENSES.
• HANDCUFFS	LIGHTWEIGHT PLASTIC, POSSIBLY FORM FITTING AND MORE DURABLE AS WELL AS STRONGER.
FORENSIC TECHNOLOGY	
• CHEMICAL INTERACTIONS FOR DETECTION OF LATENT PRINTS BY:	
1) FUMING	FUME ADHESION OR APPLYING IODINE TO AN OBJECT.
2) SPECTROSCOPIC FLORESCENCE	COMPONENTS OF FINGERPRINT ABSORB LIGHT WHICH LUMINESCE WITHIN DIFFERENT WAVE LENGTHS OF THE ULTRAVIOLET SPECTRUM.
3) ARGON-ION LASER	EMITS LIGHT TO ILLUMINATE FINGERPRINTS LEFT BY PERSPIRATION, BODY OIL AND FOREIGN SUBSTANCES ON THE SKIN.
• ELECTRONIC SCANNERS/ ELECTRON MICROSCOPE	TO DETECT GUNSHOT TRACES AND GUNSHOT RELATED PARTICLES AND RESIDUE.
• ELECTROPHORESIS	ANALYSIS OF BLOOD STAINS INTO TEN SEPARATE BLOOD TYPES AND CATEGORIES FOR IDENTIFICATION.
• LIFE SCIENCE ANALYSIS	ANALYSIS OF TEETH, SKIN, HAIR, BLOOD, SEMINAL FLUIDS, ATMOSPHERIC CONDITIONS AND MOISTURE TO DEVELOP INFORMATION ON TYPE, VICTIM LOCATION, TIME SEQUENCING, MOVEMENT, AND OTHER DETAILS OF A CRIME SCENE OR CRIME VICTIM TO DEVELOP AND CONDENSE RELEVANT INFORMATION AND APPREHEND THE OFFENDER. IN RECURRENT CASES, USED TO DEVELOP A PROFILE OF THE CRIMINAL FOR PREVENTION AND CAPTURE OF THE PERPETRATOR. THIS AREA INCLUDES THE RECONSTRUCTION OF A BODY, FINGERPRINTING, FOOTPRINTING, BLOOD AND SEMINAL FLUID ANALYSIS AND VARIOUS TECHNIQUES TO REASSEMBLE THE CRIME, VICTIM AND CULPRIT.
• ENTRY ACCESS	LIVE FINGERPRINTS, RETINAL BLOOD VESSEL PATTERNS, FOUR FINGER LENGTH MEASURE, VOICE ACTIVATION, BRAIN WAVE PATTERNS, IDIOSYNCRACY ANALYSIS BOTH PSYCHOMETRIC AND BIOMETRIC.
SOCIETAL TECHNIQUES	CREATING COMMUNITY CONCERN AND SAFETY, WHILE REDUCING THE NEED FOR POLICE AND JUDICIAL INVOLVEMENT.
• COMMUNITY MEDIATION RESOLUTION CENTERS	A COMMUNITY APPOINTED GROUP TO ACT AS ARBITRATORS IN VARIOUS CONCERNS SUCH AS NOISE, CLEAN-UP AND INTERCOMMUNITY CONFLICTS.

TABLE 2-8 (CONTINUED)

• JUSTICE CENTERS	A COMMUNITY APPOINTED GROUP TO ACT AS JUDGES IN CASE OF MONETARY OR PHYSICAL DAMAGES TO PERSONS OR PROPERTY RATHER THAN OR PRIOR TO COURT ACTIONS. SENTENCES OF RETRIBUTION, COMMUNITY SERVICE OR OTHER PUNISHMENTS ARE DOLED OUT.
• ENVIRONMENTAL DESIGN	REDESIGN OF THE NEIGHBORHOOD BY BUSINESSES AND RESIDENTS TO DEVELOP DEFENSIBLE SPACES, CONTROLLED ACCESS, TARGET HARDENING AND SYMBOLIC BARRIERS; PROVIDE NATURAL OPEN PATHS AND SURVEILLANCE AREAS; DEVELOP NETWORK SUPPORT BY POSITIVE INFLUENCE AND TERRITORIAL REINFORCEMENT. TRAFFIC REDUCTION BY THE CHANGING OF ROADWAY AND SPEEDS TO ALLOW SAFER PEDESTRIAN MOBILITY WHILE MAINTAINING VISUAL SURVEILLANCE. THE ELIMINATION OR REMOVAL OF DETERIORATION TO PROVIDE SAFER, CLEANER INHABITATION WHILE ELIMINATING AREAS WHERE UNSAVORY CHARACTERS LOITER.
• FAMILY SUPPORT SERVICES	
1) VICTIM/WITNESS ASSISTANCE	TO SUPPORT OR AID THOSE PERSONS SUFFERING FROM TRAUMA OR POTENTIAL VIOLENCE BY PROVIDING MENTAL AND PHYSICAL ASSURANCE, SAFETY AND AID.
2) HOTLINES	COMMUNITY PHONELINES USED TO REPORT PROBLEMS AND PROMOTE AWARENESS AND SAFETY. INCLUDES DRUG, RAPE, SUICIDE AND OTHER HELP HOTLINES MANNED BY TRAINED VOLUNTEERS. REPORT PHONELINES TO COMMUNITY OR POLICE TO REPORT CRIMES, CRIMINALS, DRUG PUSHERS, PROSTITUTION, CRIME INFORMATION.
3) PATROLS	FOOT, CAR AND TENANT PATROLS SUCH AS NEIGHBORHOOD WATCH TO MAINTAIN SURVEILLANCE, PROVIDE ASSISTANCE AND REPORT PROBLEMS TO THE POLICE.

At present, community law enforcement operations consist of three working shifts, one relief shift and administrative/support personnel. This reality of five 8-hour working shifts effectively reduces the number of active duty police officers from 1/1000 persons to 1/5000 persons.

The following summarizes the four technologies currently being used by law enforcement and security agencies, as preventative measures to violent and property crime.

Detection Technology

Detection technology focuses on two areas: precrime detection and perpetrator detection, with greater advances being made in the latter.

Crime detection trends focus primarily on the electronic monitoring of human interactions within commercial and residential facilities. Sensors, alarms, and lasers are being modified for accuracy, equipped with independent power units and miniaturized to thwart criminal tampering, prevent false alarms, detect movement and sound, and then silently summon the appropriate security personnel.

Criminal profiles are developed for common and serial types of crimes to aid in the identification of potential criminal "patterned" behavior. For example, if four of five characterizations of a known hijacker fit a person attempting to board an aircraft, that person will be denied access.

Psychometric and biometric scanner/analyses of entrants to the home, business and high security areas are presently under development. By the end of the 20th century, these devices are expected to be in all new buildings, with retrofitting begun for many older facilities. Such devices will scan all mammals, including household pets and guard dogs, prior to allowing access.

Spectrographs (voice scanners), typically used to analyze and verify voices in communicated transmissions, will be extended to include the identification of kidnappers, terrorists and illegal transactions. Voice prints may eventually be kept on file much like fingerprints for interagency cross-referencing. These, coupled with retinal scanners, brain wave scanners, and the previously mentioned psychometric and biometric scanners/analyzers are seen as potential methodologies for police and private security applications. A potential constraint to the deployment of such technology is its susceptibility to abuse. Fears of a "big brother" society, and accuracy questions similar to the questionable nature of polygraphs as well as cost considerations will likely limit their widespread acceptance.

Computers have been widely accepted as methods of criminal detection because of their capacity for information retrieval and storage, and their ability to facilitate communications and intercommunications. Detection devices notify security officers and start a chain of events that produce a complete record of activity, provide positive identification and a complete criminal record available at arrest. Since record searches will "flag" unusual transactions, events, or consistencies for investigation, future crime detectors, analysts and solvers may never leave the computer room.

The use of manned or unmanned lighter-than-air aircraft is presently under consideration in rural and urban areas, as an aerial surveillance technique and to provide quick mobility to the area of a disturbance. Ultralight aircraft are presently under experimental use in some states where manpower is in short supply; costs, maintenance and flexibility requirements make these feasible surveillance technology modes.

Another potential crime detection/public assistance program is the use of television channels to transmit camera images throughout the city on public television. Switching channels

will allow the viewing of schools, streets, shops, malls and traffic patterns for general population information as well as for security.

As newer, more advanced technologies are developed or refined, more sophisticated measures are used by the criminal world to counter or neutralize them. The credit card industry, among others, is already developing the next generation of security to thwart potential victimization. Embossing, holographics, encoding and combined identification implants are being developed to reduce counterfeiting, and unauthorized access.

The widespread use of computers in the home and in the office has opened a totally new area of security needs and capabilities. Several of the newer or developing forms of computer access security are listed in Table 2-8. Computers, coupled with law enforcement agencies and with improvement in scientific analysis and detection, have advanced the fields of communication, enforcement, and crime resolution; coupled with enhanced image photography, and interagency cooperation, computer technology has improved the efficiency of crime detection and criminal identification. Record searches of interagency files, faster search capability, and identification by a partial single rather than full five-digit fingerprint reduces the identification time to hours rather than weeks at a rate of 200 fingerprints or fragment prints per second. These methods are also being applied to foot printing, with and without "sock" coverings and inside protective "gloving" to detect reversed prints.

Law Enforcement

The ability of law enforcement officers to enforce and interpret the law is the major consideration in ascertaining the equipment and weaponry needs of international enforcement/security agencies.

Patrol cars in the future will have additional communications capability, including single scrambled lines for links between other patrol cars and district offices without having to go through dispatchers. This will permit timely, rapid, and ready access to information, facilitate coordination between vehicles, and upgrade the ability to collect information on a vehicle or person prior to disembarking from a patrol car or entering a potentially dangerous situation. With the automobile industry implant of vehicle identification numbers (VIN) into all newly manufactured automobiles, VIN patrol car monitors will become accepted methods of vehicle/operator identification. Monitor activation of the VIN will allow for vehicle identification, make, model, license, insurance and ownership verification, primary operator(s) description, current violations, and address of registration. In addition, the VIN can be used as a tracer to follow or locate the vehicle if lost or stolen. Once obtained, the information will allow one to judge how to approach a vehicle or occupant, reducing risks to the officer that could arise when robbery or armed occupants are suspected.

Super-plastics and communication developments are leading to improvements in protection and arrest equipment. A light weight, all purpose helmet, with internal communications equipment, will eliminate the need for carrying several different pieces of equipment by combining capabilities. The multipurpose helmet will be a walkie-talkie, gas mask, and riot helmet combined. Super-plastics may provide lightweight, easy to manage handcuffs with more flexibility and strength. Probationers or "weekend" criminals will be subject to ankle or wrist bands with communications implants. During confinement periods the automatically programmed device must remain within a prescribed distance from the individual. Failure to comply will result in the detention of the delinquent individual.

Forensic Technology

Forensics, the science of crime scene analysis, can now detect clues that would not normally be observed, allowing reconstruction of the chronology of an event and narrowing a potential criminal's identity through fingerprints, footprints, blood typing (presently ten characteristics can be identified), hair, tissue and other biological analyses. These techniques include much technology previously developed for the medical and biological sciences such as outlined in the medical technology section of this report.

Societal Techniques

Traditional law enforcement will be adapted to the automated, computerized patrol car, and officers on the streets "walking the beat." The foot patrolman will continue to engage in day-to-day contact with the people, reinforcing their confidence and probing the environment with his eyes and ears open for potential difficulties. This information can then be fed into computers for future use and application.

Law enforcement agencies are freed for other duties in the community when public awareness, concern, and neighborhood involvement are encouraged. Methods of including the community in security and safety are depicted in Table 2-8. These measures are generally initiated by the community and centered around education and group participation.

An example of this community involvement is the Criminal Justice Service (CJS) Division of the American Association of Retired Persons (AARP), formed to publicize the difficulties of the elderly. The AARP-CJS now extends its research and training/education methods to security agencies, police forces and the overall population. Extensive training and awareness programs by groups such as the AARP are developed for neighbor-

hood watches, crime watch groups, and crime hotlines. These groups also inform the public of troublesome areas, special problems, various hazards, safety measures and deterents against crime and violence. The business community, concerned with the loss of income through theft, larceny and deteriorating environments is becoming more involved in community action and redevelopment groups. These groups concentrate on reducing the fear level of pedestrians, building deterioration, providing delivery or escort services for shoppers, and safer shopping corridors.

In summary, community and business interaction in street design, beautification, educational program promotion and recreational facilities, improve the mental, physical and financial security of all concerned parties. The reappearance of the foot patrolmen re-enforces this secure environment and reduces the potential for criminal activity. With improvements in police communication and equipment, a more efficient and publicly responsive police force would be possible.

Conclusion

Accidental violence, with motor vehicle accidents their major component, have been declining. Safety measures and public awareness of safety and accident prevention are frequent targets of consumer and media "blitz" efforts. Organizations promote programs, campaigns and media attention to fires, poisoning, and water safety as well as several facets of motor vehicle safety--driving, intoxication, safer vehicles, law reforms and increased enforcement.

Reductions in violence are being promoted in two ways: protecting persons and property through awareness and safeguards, i.e., locks, surveillance and self/property defenses; and, rehabilitation or prolonged incarceration of repeat offenders. Short and near-term methods are discussed below. The deliberate crime increases are unexplained, although the tendency is to believe

that they are an indication of the economic conditions of a country, employment and welfare rolls, or unemployment programs (see C.2.5, Protection Against Financial Deprivation).

Whether they are attributed to low standards-of-living or boredom, juvenile crimes are unexplainably high; peer pressure is an additional causal factor among these crimes.

The high occupancy rate of U.S. prisons and reformatories is a concern that calls for reforms in our courts and penal system, as well as with the arrest and prosecution procedure. Courts tied up with nonincarceration offenses require a longer holding period for a crime suspect; hence overcrowding occurs. After additional facilities are built, they may become vacant edifices if the number of crimes and sentencing is reduced.

C.2.3 MAN-MADE VIOLENCE TO THE COLLECTIVE

Man-made violence to the collective results from human activities which adversely affect human society or the physical environment.

Webster's Dictionary defines environment as "the complex of climatic, edaphic and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival." The scope of these factors may be regional, global or an interactive component involving both. Regional factors are those confined to areas of limited extent, encompassing air quality, water quality and the consequences of exploiting resources. Global environmental factors are those affecting the entire biosphere and encompassing the atmosphere, oceans and the consequences of worldwide resource exploitation.

Regional Environment

Human activities often affect environmental areas many miles from the polluting source. Such effects are regional in scope

and not necessarily confined within a national border. This necessitates a biphasic discussion of regional environmental issues: 1) as they relate to the borders of the U.S. and its contemporary nations and 2) as they relate to the broader issue of the long-range effects of pollution on all countries within an extended geographical area.

The areas of concern within the regional environment are:

- Air quality,
- Water quality,
- The consequences of exploiting resources,
- Changes in land use,
- Loss of wildlife resources.

In the following subsections each area of concern, with its principal indicators, will be identified and discussed. Where appropriate, broader, extended geographical issues will be identified and their implications explored.

Air Quality

Deterioration of ambient air quality has historically been observed through easily identified effects, such as ill-health, loss of visibility or soiling of buildings and monuments. Since 1950, advances in technology and an accompanying increase in quantitative data have contributed to an understanding of the cause and effect relationship between human activity and primary air pollutants. Five pollutant compounds are currently recognized as primary indicators of air quality. All of these pollutants, described below, are mainly attributable to the combustion of fossil fuels. The primary source of these pollutants is vehicle emissions; industry is their secondary source.

The observable effects of these pollutants are as follows:

- **SO_2 and particulates**--react chemically and physically in the atmosphere to form aerosols or minute quantities of dispersed solid or liquid matter. The resultant pollutant complexes affect the respiratory function, particularly in persons having an existing respiratory condition, reduce visibility and contribute to acidic depositions as particulate sulfates or acid precipitation.

- **NO_x, HC and photochemical oxidants**--in the atmosphere NO is rapidly oxidized to NO_2 a toxic gas which in turn begins a series of complex photochemical reactions. In the presence of HC, photochemical oxidants are formed, such as ozone, peroxyacetylnitrate (PAN) and nitric acid (which contributes to acid rain). All of these compounds impair respiration, visibility and damage plant life.

- **CO**--The result of the incomplete combustion of fuel, carbon monoxide impairs the blood's ability to absorb oxygen, reducing physical performance and affecting the nervous system.

Table 2-9 presents these major pollutant emissions for the U.S. and four contemporary nations. The data are compared on a 1970 level that assumes 100 tons total emitted pollutant for all countries. Caution should be observed, however, when interpreting data based upon such an artificially assigned value. The data indicate the trend of emissions for each pollutant over time and offer a comparison of each emission, expressed in tons per 1000 tons of oil equivalent.

The data show that the U.S. reduced the total emissions of three pollutants (CO, HC, SO_2) while particulates and NO_x increased

TABLE 2-9

EMISSIONS OF MAJOR AIR POLLUTANTS 1965-1975

TOTAL EMISSIONS IN TONS

	PARTICULATES			SO_2			NO_x			CO			HC		
	1965	1970	1975	1965	1970	1975	1965	1970	1975	1965	1970	1975	1965	1970	1975
U.S.	--	100	100.6	--	100	88.3	--	100	108.8	--	100	86.1	--	100	88.2
JAPAN	--	100	--	62.0	100	52.0	48	100	107.9	--	100	--	--	100	--
ITALY	70.0	100	--	61.7	100	--	63.8	100	112.9	67.9	100	--	69.6	100	79.5
FRANCE	81.6	100	49.4	73.8	100	147.0	65.3	100	132.0	75	100	116.6	76	100	93.4
F.R. GERMANY	202.8	100	47.6	96.9	100	85.1	82.5	100	114.0	--	100	--	79.4	100	98.4

EMISSION IN TONS PER 1,000 TONS OF OIL EQUIVALENT

	PARTICULATES			SO_2			NO_x			CO			HC		
	1965	1970	1975	1965	1970	1975	1965	1970	1975	1965	1970	1975	1965	1970	1975
U.S.	--	18.5	8.5	--	18.5	15	--	13	13	--	--	51	--	--	15
JAPAN	--	18.5	--	21.6	18.5	8.3	6.7	7.5	6.9	--	--	--	--	--	--
ITALY	--	--	--	--	--	21	--	--	2.5	--	--	--	--	--	9.5
FRANCE	--	--	3.6	12	12.6	17	5.5	6.5	7.7	--	--	4.2	--	--	2.5
F.R. GERMANY	--	--	2.1	22.6	18.2	15	--	7.2	7.9	--	--	--	--	--	7.7

SOURCE: THE STATE OF THE ENVIRONMENT IN OECD MEMBER COUNTRIES, 1979

slightly. France and F.R. Germany reduced particulate emissions by the largest fraction; concentrations of other pollutants increased or remained relatively stable. Japan decreased SO_2 emissions by the largest fraction, based upon the 100 ton level of 1970.

In 1975, with regard to emissions in tons per oil equivalent consumed, the U.S. assumed a poor posture compared to its contemporaries in all pollutant categories. Legislative revisions since 1970 and advances in automobile emissions control technology may have impacted this position, though no supportive data are presently available.

Overall, while the U.S. position on air quality appears to be negative, other contemporary nations are not significantly better, based upon available data. This general result of poor air quality condition derives from a deficiency in regulatory requirements and limitations in the efficiency of pollution control technologies.

Two reported pollutants have shown regional consequences. Sulfur dioxide, with associated sulfates, and nitrogen oxide with associated nitrates have been linked to the long range transport phenomena of acidified precipitation. Two principal regions of the world are known to be affected: Eastern North America and Scandinavia. The sources of the contributing pollutants for North America are believed to be located primarily in the mid-western U.S. and south central Canada; central Europe contributes to the Scandinavian acidity problem.

Five types of effects have been observed in these two regions and in some of the source countries: 1) acidotrophication, the phenomena of the rapid drop in the pH of natural lake and stream water, resulting in waters of extreme clarity but which are unable to sustain aquatic flora or fauna, 2) random loss of forests above 1212m altitude, 3) loss in crop yields, 4)

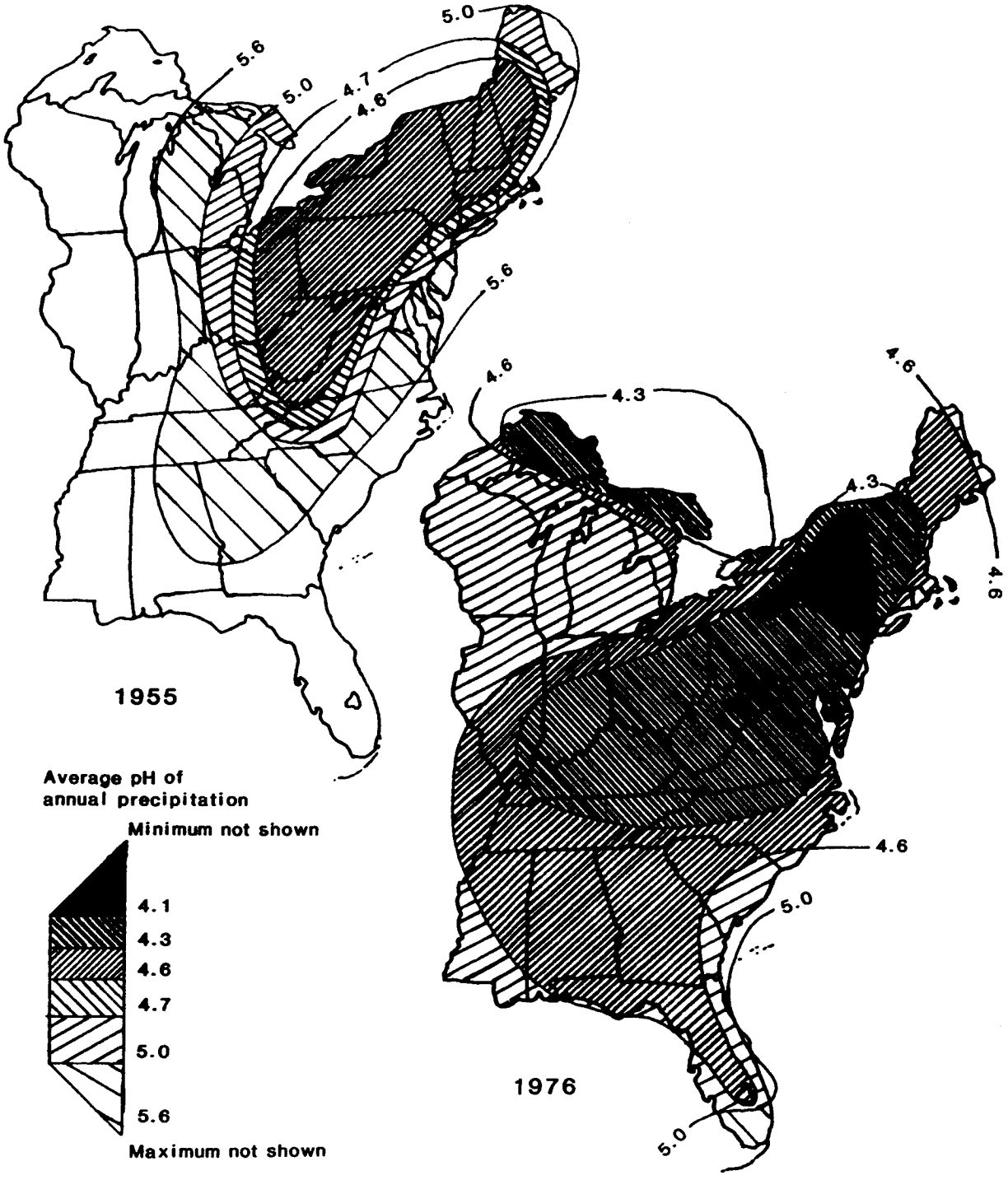
deterioration of buildings, monuments and other man-made structures, and 5) mobilization of heavy metals in soils, waters and the atmosphere. It is not certain whether these suspected pollutants are totally responsible for the observed wide ranging effects, though the trend in declining pH of regional precipitation such as presented in Figure 2-3 provides evidence for concern.

Small quantities of toxic substances are emitted when coal, oil or gasoline are burned. Several of these compounds, which are not measured in many countries, are subsequently deposited on land and in water where they are mobilized into the food chain, allowing bioconcentration. Nickel, cadmium, mercury, lead, beryllium, vanadium, halogenated organics and benzene have been measured in some countries. Travel of these compounds over vast distances has been established by the presence of tetraethyl lead, a component of automotive fuel, and polychlorinated biphenyls, a transformer coolent, in the Greenland ice pack. Many of these toxic substances are known carcinogens and teratogenic agents. The effects of long-term, low-level exposures on human health have yet to be established.

Water Quality

An uncontaminated water resource is a necessity for sustaining all forms of life. Water is used as a natural food producer, for irrigation, in the operation of industry and for individual consumption.

The quality of natural waters varies within a region, country or locality. Larger water bodies are monitored by state and federal agencies, but principal authority and continuous monitoring activities are the responsibility of each state, in conjunction with users such as municipalities and industry. This presents a large volume of locality specific databases. Evaluations, therefore, must be made by using a specific river located



Source: Environmental Trends, Council on Environmental Quality 1981

Figure 2-3. Acid Precipitation in the Eastern United States, 1955-1976

within a specific state or province. Certain general trends are known.

Aquatic pollution involves two common classes of pollutants: 1) oxygen-demanding matter and 2) micropollutants.

Materials that increase the biological oxygen demand (BOD), the additional oxygen required to decompose the material through biological (microbial) processes, are usually of an organic nature. Some primary sources of BOD increasing materials are municipal waste water treatment plants, paper and pulp mills, oil spills and industrial facilities.

Accidental oil spills (Figure 2-4) have occurred quite frequently and have received much public attention. The damage that results from oil thus spilled from ships or platforms is usually local and of limited duration. However, the effects of exceptionally large spills, such as those from the Amoco Cadiz or Torrey Canyone, which led respectively to spillages of 230,000 and 117,000 tons, can persist for several years. These effects may include damage to fish, plankton, sea birds and other organisms, which lead in turn to the impairment of fishing and shellfish farming. These spills may also result in damage to beaches and shorelines, leading to losses in the hotel and tourist trades and in amenities.

Although the probability of tanker accidents resulting in oil spills throughout the oceans is relatively low, the risk increases considerably where traffic is heavy. Moreover, as noted above, the damage is likely to be serious if accidents happen close to coasts where economic activities are concentrated. This is the case in the English Channel, the North Sea, and along the U.S. Eastern Seaboard, all of which are important centers of fishing and tourism. Prevention, in the form of agreements on navigation, is increasingly seen as the best means of dealing with tanker accidents.

TABLE 2-10

PERCENTAGE OF NATIONAL POPULATIONS SERVED

BY DOMESTIC WASTEWATER TREATMENT

COUNTRY	DATA YEAR	% POPULATION
U.S.	1965	55
	1975	77
JAPAN	1965	7
	1975	23
FRANCE	1970	32
	1975	40
F.R. GERMANY	1965	51
	1975	80
ITALY	1971	12
	1975	—

SOURCE: THE STATE OF THE ENVIRONMENT IN OECD MEMBER COUNTRIES, 1979

Figure 2-4. Major Marine Oil Spills That Have Occurred On The World's Oceans, 1968-1980

While oil spills are often dramatic, land based sources of coastal pollution are much more significant. These include operations at terminals and in ports and also oily water discharges from off-shore platforms. Such discharges, because of their constant rate of occurrence, can cause major changes in affected areas.

Levels of suspended solids and other oxidizable (BOD) matter have stabilized or begun a decline in the nonindustrialized regions of France, Japan, F.R. Germany and the U.S., though specific comparisons are as yet unavailable. This trend in BOD materials decline is attributable to the utilization of less polluting technologies, slower industrial growth and the increased number of industrial and municipal waste water treatment facilities. Table 2-10 shows the percentage of national populations served by such facilities. For the purpose of this Table, domestic waste water treatment includes primary (physical removal of large solids), some secondary (biological degradation of solids) and some tertiary (chemical) treatment. These processes will not treat toxic effluents.

The significance of the data is twofold: 1) where the data allow trend comparisons the percent of population served shows the increase in treatment for each country and 2) F.R. Germany and the U.S. provided treatment to the largest proportion of their populations, followed in descending order by France, Japan and Italy.

Consequences of Exploiting Resources

Micropollutants are of minute quantity but high toxicity. These pollutants are the pesticide residues, heavy metals and fertilizers which are released into the aquatic environment via industrial effluent, agricultural runoff, urban and highway runoff or atmospheric fall-out. The number of compounds from these sources found to be toxic increases daily; regulatory efforts

have been made to control some of these compounds, such as mercury, DDT and PCBs. Because of their persistent nature, many of these toxins continue to redistribute and recirculate within the food chain, ultimately accumulating in human tissue (see Figure 2-5) before final degradation.

Two micropollutants that stand out as of particular concern are phosphorus and nitrogen compounds. These compounds have no immediate biological toxicity unless inordinately concentrated, and are necessary nutrients for aquatic plants and phytoplankton. As human population pressures in and around water bodies supply increasingly larger concentrations of these compounds, coupled with increased agricultural fertilizer runoff, an acceleration of the natural eutrophication process is triggered through nutrient excess. This results in several problems:

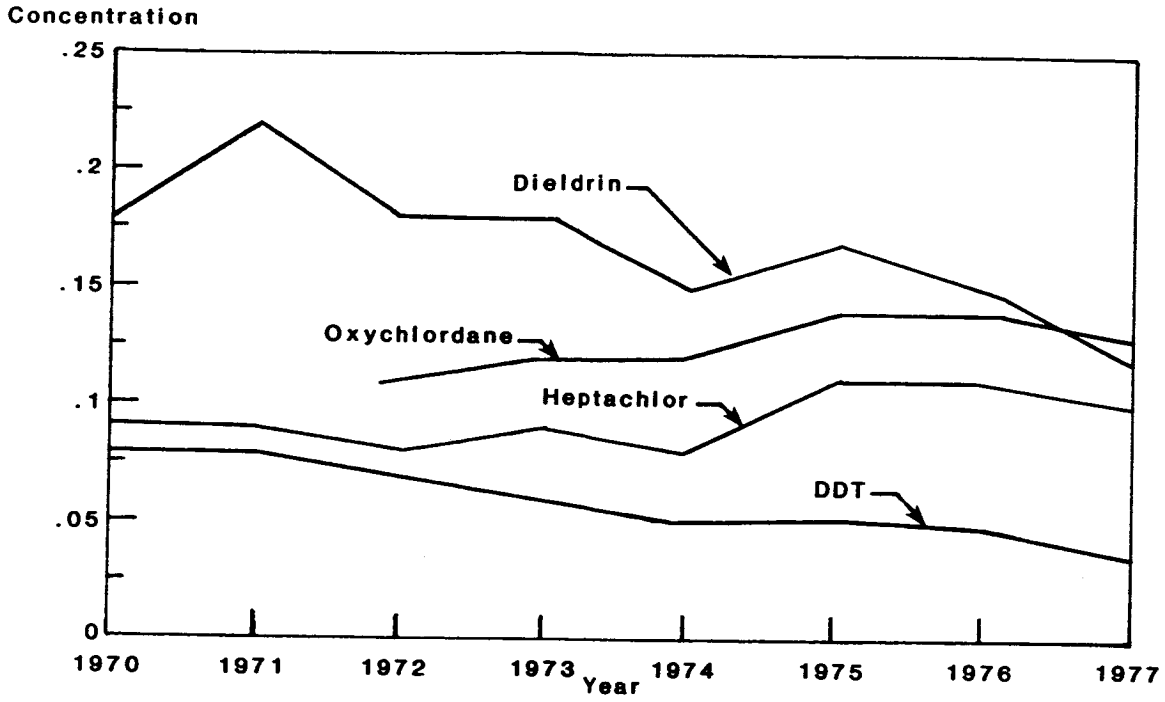
- Exponential algae growth, known as "blooms," increase respiration rates in aquatic systems resulting in deoxygeneration and loss of fish species diversity;

- Increases in odor levels and other aesthetic qualities result in reduced recreational and water supply uses;

- Increases in the cost of technology and chemicals necessary to purify the water for industrial and municiple water use;

- Loss of commercial fishing industries through species migration to cleaner waters.

In all OECD countries, the major water bodies have deteriorated through accelerated eutrophication and other micropollutant-caused conditions. Some examples include Lake Erie, Lake Ontario and the Chesapeake Bay in the U.S., and the Mediterranean seaboard of OECD member countries. Coastal waters pose significant environmental problems since coastal lands are in ever increasing



DDT concentrations are 100 times larger
than are shown here on this graph

Figure 2-5. Toxic Residues In Human Tissues

demand for tourist facilities, oil ports and refineries, power plants, petrochemical facilities and other forms of heavy industry. Pollution caused by such heavy concentrations of industry and population is further exacerbated by inland rivers which carry their own pollution burden, and often empty into harbors and bays. In most coastal areas of OECD member nations, pollution by domestic sewage and industrial waste exists in toxic quantities, but is not widespread, see Figure 2-6. The microbial pollution from inadequately treated sewage occurs at many bathing resorts on the northern Mediterranean coast. Where such pollution occurs, outbreaks of viral hepatitis and poliomyelitis are possible; contaminated shellfish are rendered inedible; in the U.S. sewage microbes have closed an estimated one-fifth of the near-shore shellfish grounds.

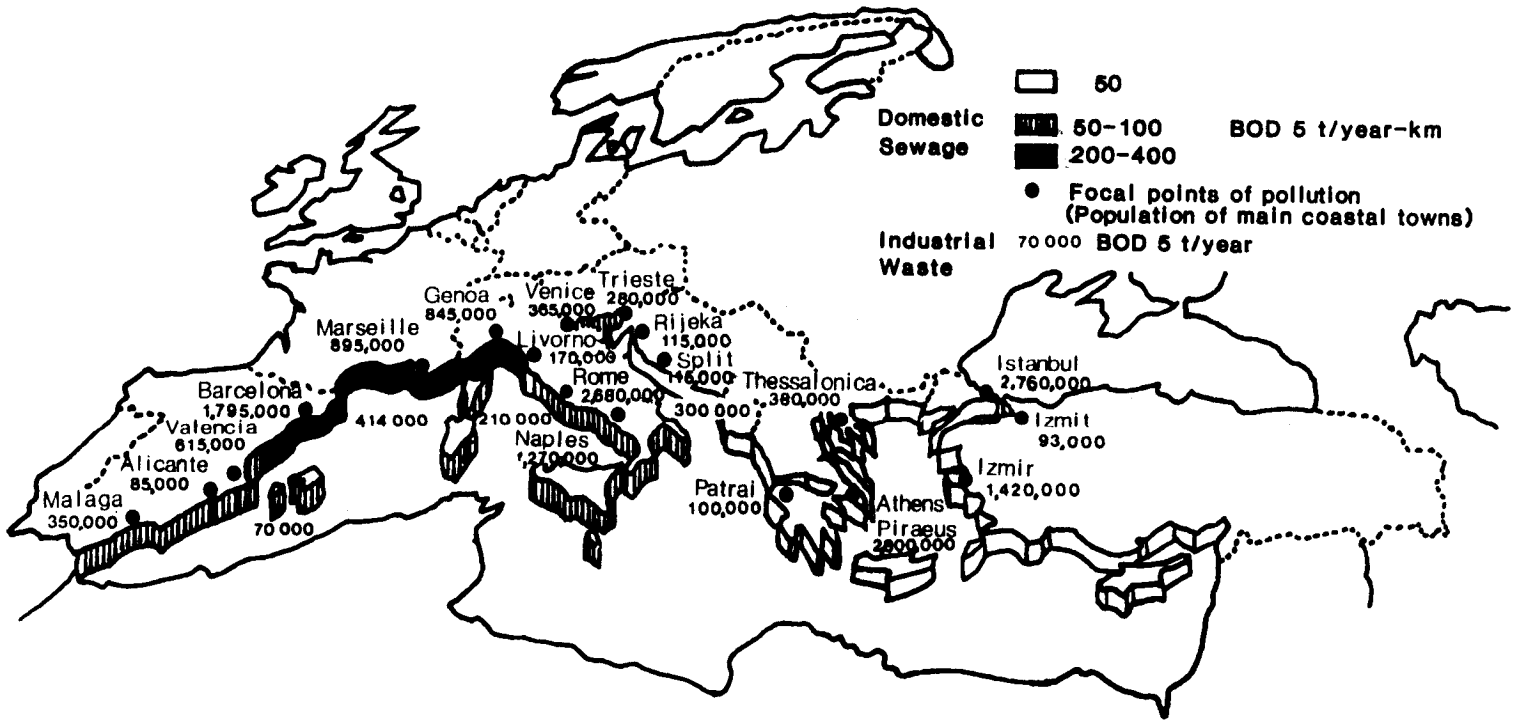
Such contaminations of shellfish and other aquatic life coupled with the destruction of coastal marshes and natural vegetation through the creation of construction projects have severe consequences for wildlife. Loss of habitat and alteration of historic feeding areas create severe pressures upon migratory birds and fish. In many cases, such as the striped bass industry of the Chesapeake Bay, declines in fish stocks within the past ten years have been dramatic though largely unstudied.

To summarize, of the two classifications of pollutants, sewage/organic matter (BOD materials) comprises the largest fraction by several orders of magnitude. This results in the following conditions:

- High biological oxygen demands resulting in low aquatic productivity and limited species diversity;

- Contamination of fish and shellfish with pathogenic bacteria and viruses;

Pollution of the Mediterranian by Domestic Sewage and Industrial Waste, 1974



BOD 5 : biological oxygen demand i.e. the amount of oxygen required to biodegrade a given load of pollution in water over a period of five days.

Source: State of the Environment in OECD Member Countries

Figure 2-6. Polluted Coastal Areas of OECD Member Nations by Industry, 1974

- Agricultural runoff of soils and fertilizers resulting in the burying of benthic species and aquatic vegetation; high respiration rates from algae blooms and low-light penetration in shallow water submerged grass beds, destroying aquatic nurseries.

Toxic materials, though low in relative volume, constitute the largest long-term threat to aquatic environments for two reasons:

- Nonbiodegradable toxics such as heavy metals and PCBs render fish and shellfish inedible and result in long term (scores of years) restrictions on the use of these resources.

- Biodegradation of toxic substances susceptible to these processes may take several decades as is the case with most pesticides. In severe concentrations such organisms as normally would aid in degradation may be totally overwhelmed, resulting in sediment sterilization.

The organic (BOD) pollutants are controllable through enhanced waste treatment of sewage and controls on development along rivers and coastal areas. Technologies exist which can eliminate these problems, but are inadequately distributed and costly where advanced levels of technology are required. Non-point source agricultural runoff pollution is partially controllable through contour farming and limited field frontage on rivers. While these measures are somewhat effective, resistance by farmers to contour farming persists in all OECD countries, although efforts to enforce such measures continue.

Changes in Land Use

Land provides the basis for virtually all human activity. It is a primary source of raw materials and building sites for

the settlement and production of food. Historic changes in land use have occurred through the need for increased agricultural land areas to feed growing populations and the additional changes in favor of urban expansion for dwellings and businesses. Table 2-11 depicts the historic change in land uses resulting from these pressures. Table 2-12 shows the actual land use for selected OECD countries as of 1975.

The significance of the data is in the land use trends for each country. Arable land increased slightly in the U.S. but decreased in Japan, F.R. Germany, France and Italy. Grassland was reduced in the U.S. and F.R. Germany, while increases were noted in Italy and France. The U.S. saw a reduction in wooded areas while 1% increases were noted in Japan and F.R. Germany, and a 25% increase in France. In the other land category, Italy saw the largest increase (40%) followed in descending order by the F.R. Germany, the U.S., and Japan. France showed a decrease in the other land use category. Other land use is the key factor in determining losses of land use within the other three categories. Since nations do not normally lose mountains, deserts and inland water to any significant degree, in can be inferred that the losses in wooded, arable and grasslands result largely from increases in the urban land designation. For example, from the period of 1950 to 1970, built-up land increased by 25% in the U.S. and by 35% in F.R. Germany. For the U.S., land converted from farmland for highways, urban development and other uses average 420,000 hectares/year. This may explain part of the losses of grass or wooded land to replace agricultural land noted in Table 2-12.

A secondary consideration is the condition of land. Natural heterogenous forests are often replanted with monospecific lumber or paper crops. Over time this results in the deterioration of soil quality and a greater susceptibility to disease from reduced genetic diversity. In addition, as once productive agricultural land is exhausted, the subsequent move to climatologically favor-

TABLE 2-11

HISTORIC CHANGES IN LAND USE 1955-1975[a]

BASE 100 IN 1955

	ARABLE LAND			GRASSLAND		WOODED LAND		OTHER LAND[b]	
	1955	1965	1975	1965	1975	1965	1975	1965	1975
U.S.	100	96.3	101.0	100.4	95.3	96.0	94.0	109.9	115.4
JAPAN	100	106.4	93.2	100.0	100.0	102.2	101.1	89.8	110.4
FRANCE	100	96.4	89.6	109.0	108.6	107.1	125.8	87.8	78.9
F.R. GERMANY	100	93.4	92.4	101.3	92.8	101.9	101.6	111.0	125.4
ITALY	100	95.8	75.4	98.3	102.2	105.7	109.4	99.2	140.0

[a] LAND AREAS ASSIGNED TO USAGE CATEGORIES SHOULD BE VIEWED IN LIGHT OF REGIONAL CLIMATOLOGICAL VARIABLES WHICH GOVERN THE EXTENT OF GRASSLAND DISTRIBUTION AS WELL AS DISTRIBUTION OF OTHER LAND TYPES.

[b] OTHER LAND INCLUDES URBAN, DESERT, TUNDRA, MOUNTAINS, INLAND WATER AND DUNES.

SOURCE: THE STATE OF THE ENVIRONMENT IN OECD MEMBER COUNTRIES, 1979.

TABLE 2-12

LAND USE IN SELECTED OECD COUNTRIES, 1975[a]

	ARABLE LAND		GRASSLAND		WOODED LAND		OTHER LAND[b]	
	km^2	%	km^2	%	km^2	%	km^2	%
U.S.	1,910,000	20.3	2,440,000	26.0	2,888,450	30.8	2,125,000	22.6
JAPAN	55,720	14.9	2,420	0.6	250,430	67.2	63,740	17.1
FRANCE	189,220	34.4	134,050	24.4	146,080	26.6	79,740	14.5
F.R. GERMANY	75,300	30.5	52,440	21.0	71,620	28.8	48,010	19.4
ITALY	123,130	40.8	52,040	17.2	63,060	20.9	63,030	20.9
OECD— EUROPE	1,164,000	26.6	872,950	19.9	1,262,100	28.8	1,071,810	24.5

[a] LAND AREAS ASSIGNED TO USAGE CATEGORIES SHOULD BE VIEWED IN LIGHT OF REGIONAL CLIMATOLOGICAL VARIABLES WHICH GOVERN THE EXTENT OF GRASSLAND DISTRIBUTION AS WELL AS DISTRIBUTION OF OTHER LAND TYPES.

[b] OTHER LAND INCLUDES URBAN, DESERT, TUNDRA, MOUNTAINS, INLAND WATER AND DUNES.

SOURCE: STATE OF THE ENVIRONMENT IN OECD COUNTRIES, 1979

able but marginal quality arid or other types of land result in increased soil erosion. In the U.S., semi-arid lands have reached an annual topsoil loss rate of 50 tons per square kilometer per year.

Table 2-13 shows the loss of topsoil in the U.S. in comparison to selected countries. Abandoned lands, with the subsequent regrowth of vegetation, may serve to enhance the wildlife populations. Those land uses which damage the utility of land are of the most concern. Industrial land and the associated toxic substances are often abandoned without regard for ultimate reuse. Such land often requires costly reclamation and results in limited use for decades. Examples are toxic waste dumps, strip mined lands and ore mine tailings. In the U.S., 10,000km^2 of land require reclamation and in Japan about 4000 hectares have been designated as requiring costly decontamination.

Wetlands are also recognized as threatened habitats. As an ecosystem they serve as necessary habitats for a variety of wildlife and act as settling points for organically polluted waters. Over the past 50 years, 1500km^2 of wetlands have been super lost to coastal development.

Problems with land contamination or reclamation have been noted for all countries, although specific data for each country are elusive. It may be concluded that loss of productive land area is a widespread problem.

Loss of Wildlife Resources

One of the principal indicators of the environmental quality of an area or region is the species diversity of the area. Species diversity refers to the number of different species inhabiting an area and does not account for each species' population size or predominant representation. Normally the greater the species diversity in an area, the greater its environmental

TABLE 2-13

LOSS OF TOPSOIL FOR SELECTED COUNTRIES

	AVERAGE ANNUAL LOSS (%) (1960 - 1970)	PROJECTED CUMULATIVE LOSS (%) (1978 - 2000)
U.S.[a]	0.08	2
JAPAN	0.48	10
FRANCE	0.18	4
F.R. GERMANY	0.25	5

[a] EXCLUDING ALASKA

SOURCE: THE GLOBAL 2000 REPORT TO THE PRESIDENT, 1980.

TABLE 2-14

SPECIES ENDANGERED OR THREATENED WITH EXTINCTION, 1975

	TOTAL SPECIES	THREATENED	% OF TOTAL
VEGETAL			
U.S.	—	—	10[a]
EUROPE	14,000	1,460	10
AVIAN			
U.S.	800	65	8
EUROPE	407	220	54
MAMMAL			
U.S.	400	36	9
EUROPE	156	36	23
REPTILES/AMPHIBIANS			
U.S.	460	12	3
EUROPE	64	15	23
FRESHWATER FISHES			
U.S.	660	39	6
EUROPE	—	—	—

[a] ESTIMATED

SOURCE: THE STATE OF THE ENVIRONMENT IN OECD MEMBER COUNTRIES, 1979

quality and stability. For any given region, however, there is a finite maximum number of species which can survive harmoniously.

Table 2-14 shows the number of species which are endangered or threatened with extinction. The significance of the data is derived from the number and percent of the total natural species population which may become extinct.

The U.S. posture with regard to endangered species is good; less than 10% are indigenous to the U.S. Each year, however, new species are found to be threatened or endangered, a trend likely to continue for European countries as well. Additions to park lands and pristine wilderness areas will provide some measure of protection to many of these species. However, long-term solutions to this problem have not been attempted or are in a vestigial stage of research.

Global Environment

Regional environmental conditions produce additional global effects. These effects manifest themselves in three principal areas: 1) the atmosphere, 2) the oceans and 3) the resource exploitation that is a cumulative result of all the regional environmental factors.

The Atmosphere

The earth's atmosphere is unsaturated and, therefore, able to absorb vast amounts of various types of gases. The relative proportion of these gases defines the ability of the planet to maintain its physical (e.g., temperature, climate, etc.) and life sustaining properties.

Atmospheric records show that carbon dioxide in the atmosphere has increased substantially since record-keeping began in 1958. Current CO_2 levels are 25ppm higher than 1958 levels and are increasing.

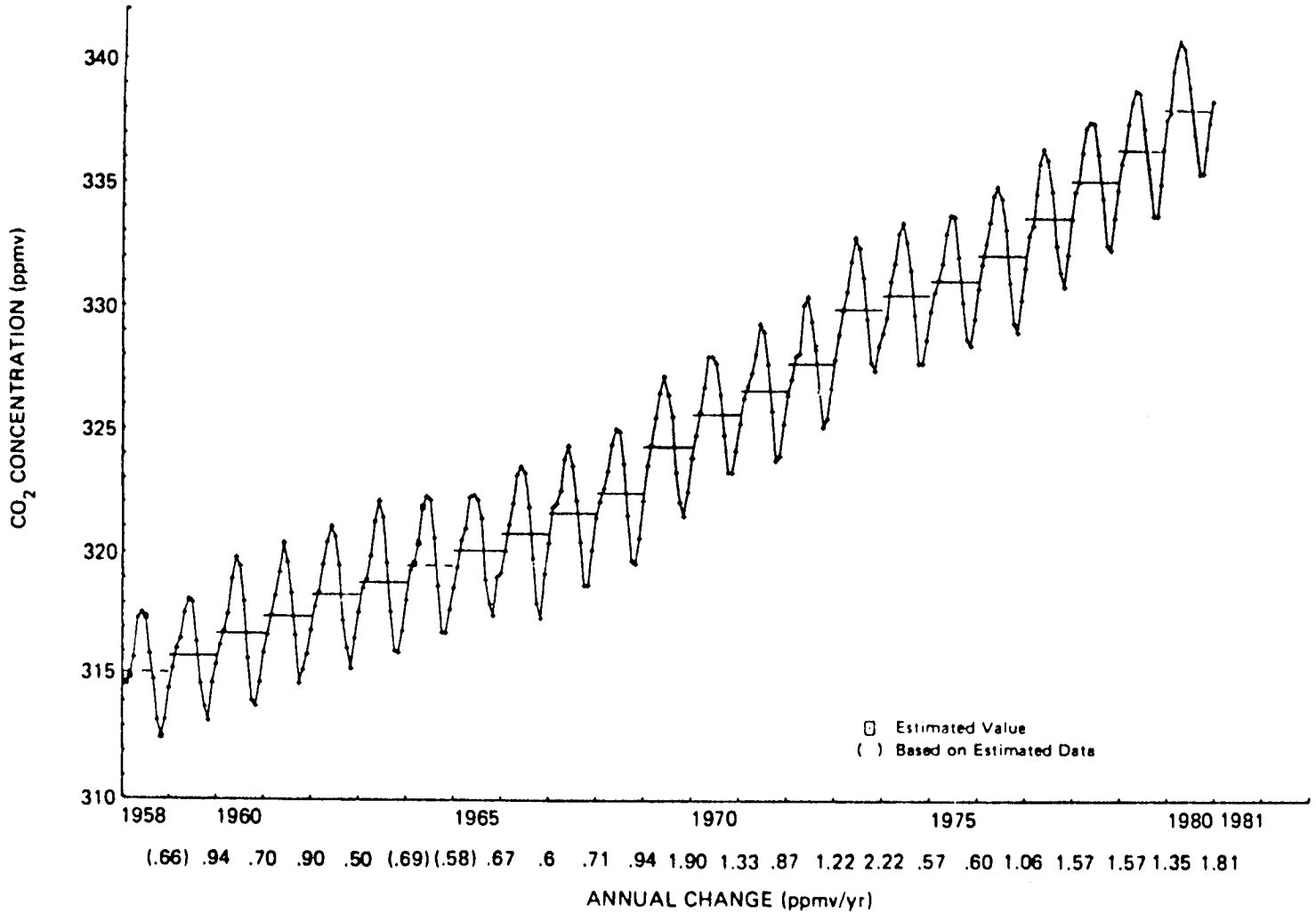
Figure 2-7 depicts this historic rise in CO_2 emissions and their atmospheric effects. The oscillations noted in these measurements, from the Mauna Loa Hawaii station, are primarily derived from the annual cycles of photosynthesis in the Northern Hemisphere. The gradual rise in CO_2 levels is largely attributed to two factors: 1) worldwide deforestation resulting in a loss of the planet's ability to absorb and retain terrestrial carbon and 2) increased combustion of fossil fuels and the subsequent release of carbon compounds. The burning of fossil fuels is considered the larger contributor.

In 1981 CO_2 emissions from fossil fuels were responsible for an estimated 1.8ppm of global CO_2. Oil accounted for an estimated 44% of this component, coal 38% and natural gas 17%. This increase of CO_2 is expected to continue at a rate of from 1 to 3% annually through the year 2030. The ramifications of such historic rises in what is considered the primary gas "involved in the greenhouse effect" are enormous.

The mean global temperature has been rising for at least the past two decades. From 1970 to 1980 global temperature rose an estimated 0.25°C. The estimated contribution of CO_2 to this rise was 0.14°C with other trace atmospheric gases--nitrous oxides, methane, and chlorofluorocarbons--estimated to have contributed 0.10°C. The extent of this trace gas involvement in an accelerating greenhouse effect is in dispute within the scientific community, although all researchers corroborate the contribution. A summation of these trace gases and their potential effects is presented below. For a graphic representation of the effects of other greenhouse gases increases on global temperature, see Figure 2-8.

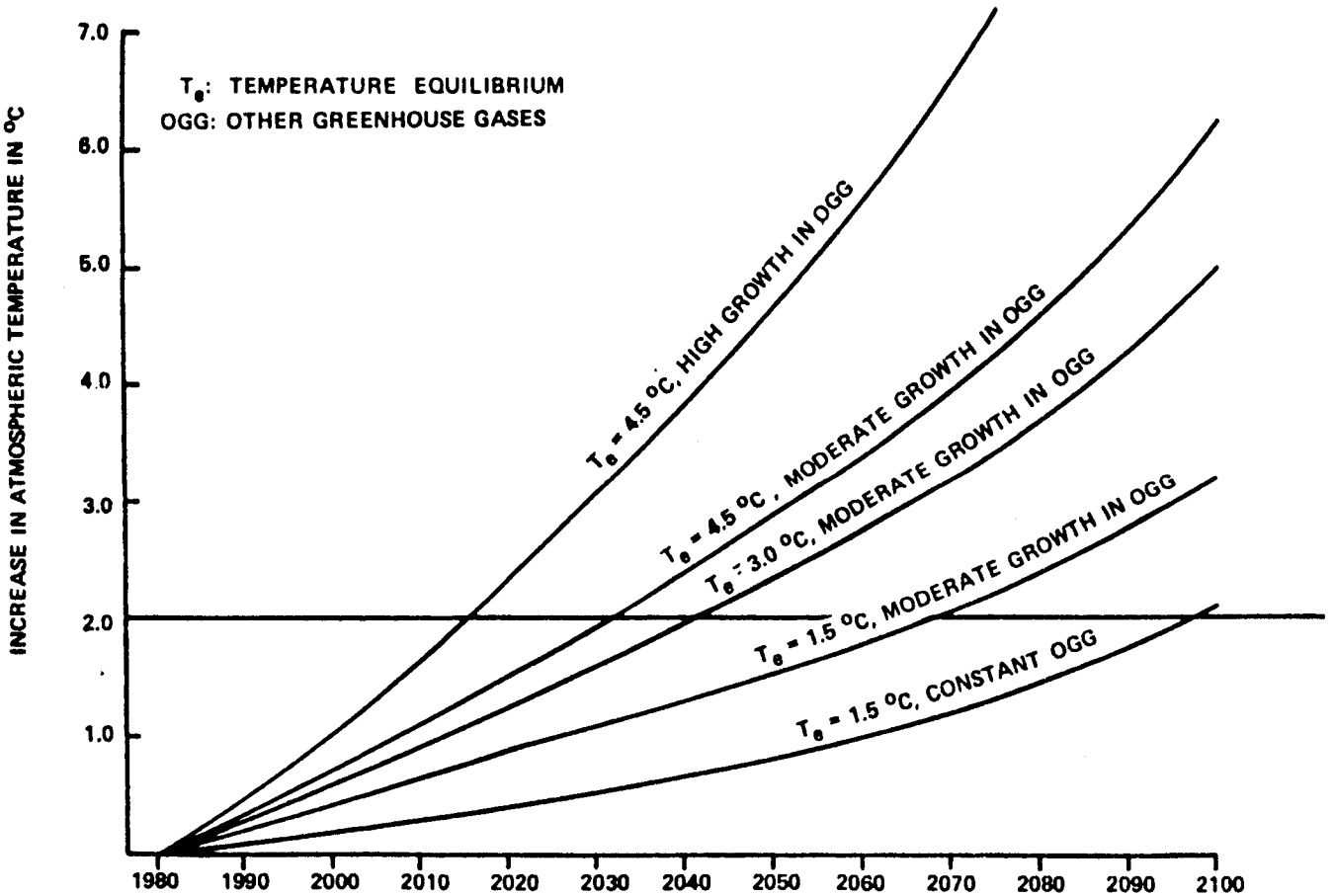
Nitrous oxide--Derived from biological denitrification processes in soils, oceans, fertilizers and sewage.

- An increase of 6ppm was noted from 1970-1980. Current levels are about 295ppm.



Source: 'Climatic Change', National Research Council, 1984

Figure 2-7. Historic Rise in CO_2 Levels



Source: 'Can We Delay A Greenhouse Warming?' CPA, 1984

Figure 2-8. Temperature Effects Attributable to Other Greenhouse Gas Increases

- A doubling of current concentrations by 2100 would contribute 0.3-0.4°C rise to world temperature.

Methane--Emitted during anaerobic decomposition processes; contributes about 8 gigatons/100 years to atmospheric trace gases.

- Increase in the CO_2 content of the atmosphere decrease the number of compounds capable of decomposing methane.

- An increase of 2% per year by methane hydrates could raise the global temperature by 0.2-0.3°C per year, a level which could increase considerably as temperatures rise, facilitating the release of methane from bogs, swamps and currently frozen sediments.

Chlorofluorocarbons--Entirely a product of human manufacturing activity, recently reaching significant concentrations in the atmosphere. The estimated direct effects of annual production levels, based upon 1973 levels, would result in a 0.3°C per year rise in global temperature and an increase in ultraviolet radiation resulting from a deterioration of the ozone layer.

Global temperature is expected to rise by 3°±1.5°C by the year 2100, lagging the CO_{++++++} increase by several decades. The possible dichotomous effects of this temperature rise on global climate are:

- A 3°C temperature increase, including a 10 to 12°C temperature rise at the polar regions and a less than 3°C rise in the equatorial region.

- Increases or decreases in the amount of precipitation regionally and changes in the distribution of precipitation.

- Sea levels by 2100 that will rise from between 56 and 345cm (2-11 feet).

The ramifications of these projected effects are potentially disastrous. Changes in temperature and precipitation may produce large scale shifts in agricultural production, desertification and vegetation. Sea level rises could inundate coastal areas, submerging port facilities and businesses, and displacing large segments of the world's population.

Even if CO_2 emissions and other trace gases were substantially reduced, temperatures would continue to rise because of the temperature lag effect. The anticipated increase would be modified but not nullified.

In summation, three facts should be emphasized:

1) Technologies exist to control most emissions from human activity. CO_2 however, is a gas produced through combustion, and is a natural by-product of organic fuels. Decreases in vegetation through land clearing or covering and retardation of the aquatic system's ability to absorb CO_2 pollutants, restrict the earth's ability to absorb CO_2.

2) The scientific data at present are not sufficient to allow absolute statements regarding climate shifts. Very little is known about global CO_2 dynamics and associated processes; a continuing research effort is therefore essential.

3) Regardless of the control measures taken, temperatures will rise globally resulting in a proportional range of the stated effects.

The Oceans

The oceans and associated coastal areas of the world constitute more than 71% of the earth's surface and 97% of its total water supply. The oceans represent the major components of global energy balance, influencing both terrestrial dynamics and the atmosphere.

Coastal areas are the most productive physical resource; 60 to 80% of commercial marine fishery species are dependent upon estuarial environments for all or part of their life cycle. In addition, wetland tidal flooding circulates detritus and dissolved nutrients to offshore organisms.

Coastal areas have historically been of importance for industrial, port and recreational utilization. As these uses increased, pollution escalated to a corresponding degree. Coastal pollution, identified with a fish disorder called "fin erosion" is common in U.S. coastal waters, the Irish Sea, Tokyo Bay, and other heavily industrialized areas. While not of immediate concern to the pelagic environment, coastal pollution is anticipated to become a major problem in open marine environments within the next three decades. This pollution is of varied forms: toxic wastes, fossil fuels, chemicals, sewage and solid wastes.

Toxic coasts include a variety of substances which are carcinogenic, mutagenic and teratogenic. These substances are also capable of synergistic effects when more than one is present in the aquatic environment. Examples of areas where toxic substance contamination have resulted in persistant damage to waters draining into coastal areas are numerous.

One example in the U.S. is the James River in Virginia, which empties into the lower Chesapeake Bay estuary. By 1975, 1.5 million gallons of the toxic pesticide Kepone had been dumped into the river. In 1976, symptons of acute Kepone poisoning began to appear among workers and other persons associated with the river. When the contamination sources were located and removed, and the pesticide contamination fully assessed, the commercial fishing industry was banned from operating in the lower river. This ban is expected to remain in effect for several decades.

In this instance, like many others, large doses of long-term pollutants were discharged, ultimately contaminating the estuary. Of more pressing concern are the thousands of identified and unidentified smaller doses of pollutants received in all of the world's coastal waters. The persistance of these toxic compounds leads to long-term bioaccumulation in human or other animal tissue.

Fossil fuels reach the oceans through numerous sources. Table 2-15 shows the estimates of hydrocarbon introduced into the oceans annually; coastal effects of such pollutants, particularly oil, are known to remain in estuarine sediment for as long as eight years after an initial spill. Marsh grasses, unable to re-establish themselves beyond three years after initial contamination, exemplify the devastating effects of our polluted waterways.

Conclusion

Environmental abuses on a regional level severely impact the global environment. Pollution, destruction, erosion and improper care have multiple, far-reaching effects, including loss of food sources and wildlife, biological dangers to mankind and widespread geographic destruction. The U.S. concern for the preservation of the environment must, therefore, be reoriented toward

TABLE 2-15

BEST ESTIMATES OF PETROLEUM HYDROCARBONS INTRODUCED INTO THE OCEANS ANNUALLY

SOURCE	BEST ESTIMATE	PROBABLE RANGE
	(MILLIONS OF METRIC TONS)	
NATURAL SEEPS	0.6	0.2-1.0
OFFSHORE PRODUCTION	0.08	0.08-0.15
TRANSPORTATION		
LOT TANKERS	0.31	0.15-0.4
NONLOT TANKERS	0.77	0.65-1.0
DRY DOCKING	0.25	0.2-0.3
TERMINAL OPERATIONS	0.003	0.0015-0.005
BILGES BUNKERING	0.5	0.4-0.7
TANKER ACCIDENTS	0.2	0.12-0.25
NONTANKER ACCIDENTS	0.1	0.02-0.15
COASTAL REFINERIES	0.2	0.2-0.3
ATMOSPHERE	0.6	0.4-0.8
COASTAL MUNICIPAL WASTES	0.3	—
COASTAL NONREFINING INDUSTRIAL WASTES	0.3	—
URBAN RUNOFF	0.3	0.1-0.5
RIVER RUNOFF	1.6	—
TOTAL	6.113	

SSOURCE: NATIONAL ACADEMY OF SCIENCES, PETROLEUM IN THE MARINE ENVIRONMENT, WASHINGTON, 1975

conservation; methods of halting and reversing the regional deterioration of air, water and land have to be extended to a worldwide effort because of the environmental interdependence among nations.

The pollution of our waterways and atmosphere must become a topic of international concern and attention. The primary considerations are: 1) the elmination of the cause, or 2) the substitution of safe alternatives to the damage causing elements. Development of an experimental organism to absorb or "eat" oil spills, though the after-effect of such an organism is still undetermined, will help eliminate some of the environmental effects of oils spills on our oceans and coastlines. Topsoil errosion is preventable, given a sufficient regard for ultimate reuse of land.

C.2.4 ALLEVIATION OF NATURAL VIOLENCE

Natural violence ranges from frequent, relatively local events, which directly affect small numbers of people, to commonly occurring regional events such as heavy rains and flooding. Regional events often affect extremely large areas and portions of the population; efforts have been and are being taken to prevent the damage and trauma from such natural outbursts by measurements, trending records, barriers, and pesticides. As shown in Figure 2-9, natural violence separates into three causal areas:

- **Geological**--damages resulting from tectonic events,
- **Climatological**--damages resulting from severe weather events,
- **Biological**--losses or damages produced by pests.

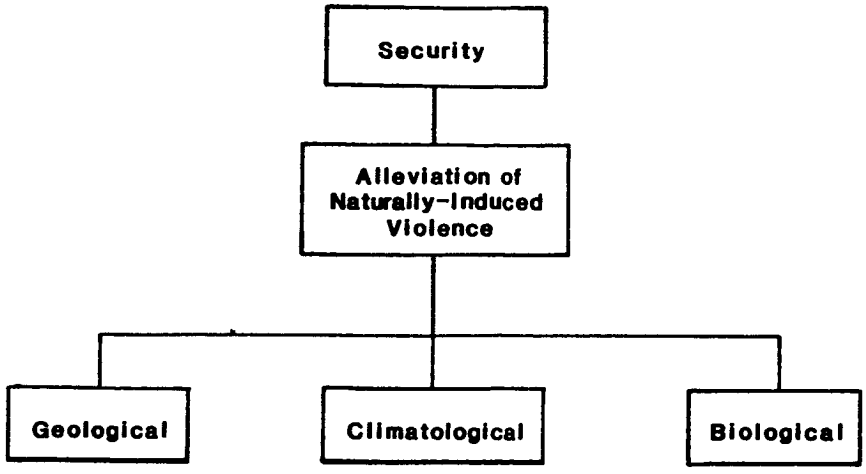


Figure 2-9. Causal Areas of Natural Violence

Each of these areas will be discussed separately. In considering climatic and biological damage, only the historical U.S. posture will be presented for two reasons: 1) The impact of these events in the U.S. itself is considerable, because of its tremendous land mass, and 2) reliable foreign data are not comparable or are unavailable.

Geological Violence

The movements of the earth's continental plates result in two types of tectonic events: earthquakes and volcanoes. Such events tend to be periodic and concentrated in areas where crustal plate edges interface.

Principal indicators of geological violence are number of yearly occurrences, deaths and estimates of property damages. In this subsection, the U.S. will be compared only with Japan and Italy, because France and F.R. Germany have no active volcanoes and few earthquakes.

Table 2-16 presents historical data on numbers of volcanic eruptions. Japan, located in the Pacific "Ring of Fire," has had the most volcanic eruptions. The U.S. has averaged between one and five a year, but in the period covered there were no active volcanoes in the continental U.S.; the only volcanoes posing a threat are in Hawaii and Alaska, where they are geographically remote and frequently unobserved except by passing airplanes. Italy's two active volcanoes, Stromboli and Etna, erupted at least once a year between 1970 and 1980; however, Italy has experienced fewer total eruptions during this period than Japan or the U.S.

In all three countries the impact of these geological events is mitigated by their relative infrequency over time. In the U.S., earthquake related deaths averaged eleven per year over 31 years. The direct effects of a volcanic eruption are fairly local, and active volcanoes are well known and monitored; therefore, they pose a minimal threat to life and property.

Earthquakes pose a greater danger than volcanoes since they are a much more unpredictable, more damaging and frequently occurring phenomena, especially in the U.S. Earthquakes have resulted in 1,380 deaths and over $5 billion damage[a] in the U.S. during the 20th century. Worldwide, they cause approximately $7 billion damage annually, and in one exceptional year, 1976, it is estimated that they resulted in 700,000 deaths.[b] Figure 2-10 presents the historical regions of known significant[c] earthquakes since 2000 B.C. Japan and Italy are two countries heavily victimized by earthquakes. In the U.S., the West coast and Alaska

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[a] National Earthquake Hazards Reduction Program: Overview. USGS Circular 918

[b] Earthquake Hazards, Bruce A. Bolt, 1978

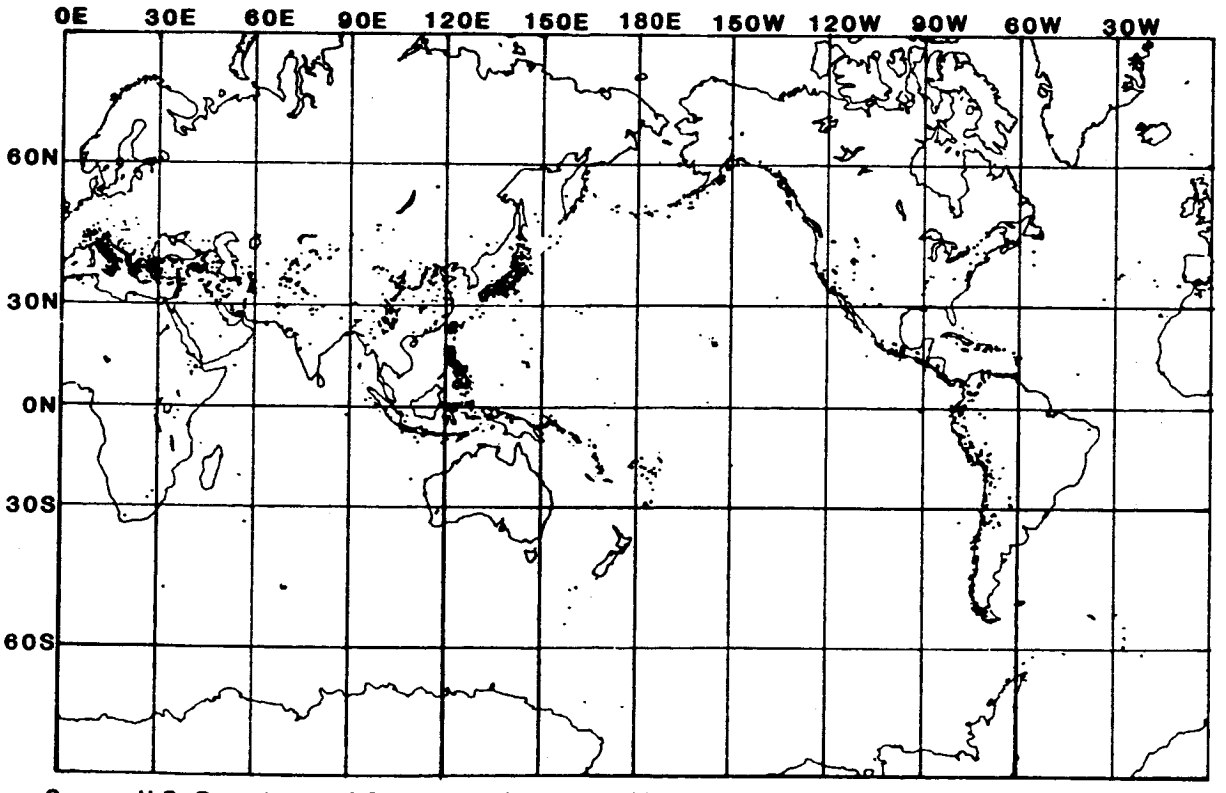
[c] Significant is defined as: $1 million or more of damage/10 or more deaths or magnitude 7.5 or above

TABLE 2-16

NUMBER OF VOLCANOES ERUPTING
IN SELECTED COUNTRIES, 1970-1980

	JAPAN	ITALY	U.S.
1970	6	2	1
1971	6	2	2
1972	4	2	3
1973	7	2	3
1974	11	2	5
1975	7	2	5
1976	6	2	4
1977	7	2	5
1978	7	2	4
1979	11	2	2
1980	7	2	5

SOURCE: VOLCANOES OF THE WORLD, SMITHSONIAN INSTITUTION, 1981



Source: U.S. Department of Commerce, Catalog of Significant Earthquakes, World Data Center, 1981

Figure 2-10. Regions of Significant Earthquakes 2000B.C. - 1979A.D.

are the primary areas affected; this is due to the proximity of these regions to the interface of crustal plates, resulting in tectonic activity.

Table 2-17 presents limited data on earthquake related deaths and damage over a very short geological time frame. In the 30 years covered, the U.S. has experienced 36 major earthquakes, Japan 12 and Italy 9. Although frequency provides some indicator of danger, one event can cause catastrophic damage (over 600,000 deaths resulted from the Chinese earthquake in 1976). Despite the low relative frequency of earthquakes in Italy over this 30-year period, the resulting loss of life (4,082) has been the greatest among the three countries considered. Comparatively, the U.S. losses have been minimal, though the damage potential from earthquakes in this country is great. In 1976, approximately one-third of the U.S. population lived in areas where significant losses from earthquakes were potentially high. One prime example is California, where the probability of a significant earthquake is high and the probable results disastrous.

Climatological Violence

Climatological violence, the broadest cause of natural violence, encompasses all deleterious effects of adverse weather. The five major examples--tornadoes, floods, hurricanes, lightning and extreme temperatures (heat waves, severe cold spells)--will be assessed through the available indicators, such as the number of persons killed and the resulting property damage. Using the example of extreme temperatures, property damage will be measured by crop losses, and the resulting deaths will be estimated from available preliminary data.

Since tornadoes are unique to the U.S., and since only Japan, of all the OECD nations, is at risk from hurricanes and typhoons, many U.S. climatological events are incomparable with

TABLE 2-17

NUMBER OF RELATED DEATHS/DAMAGE FROM EARTHQUAKES FOR SELECTED COUNTRIES, 1951-1982[a]

	U.S.			JAPAN			ITALY		
	NUMBER	DEATHS	DAMAGES (MILLIONS CURRENT $)	NUMBER	DEATHS	DAMAGES (MILLIONS CURRENT $)	NUMBER	DEATHS	DAMAGES (MILLIONS CURRENT $)
1951	1	0	3.0	2	64	30.0	-[b]		
1952	4	14	60.0	-			-		
1954	7	1	7.2	-			-		
1955	2	1	4.0	-			-		
1956	-	-	-	1	0	0.5	-		
1957	2	0	4.0	-			-		
1958	2	8	1.0	-			-		
1959	1	28	11.0	-			-		
1961	1	0	4.5	-			-		
1964	2	246	988.0	1	26	800.0	-		
1965	1	7	12.5	-			-		
1968	1	0	0.5	2	497	605.0	-		
1969	1	0	7.0	-			-		
1971	1	58	500.0	-			1	22	41.6
1972	-			-			1	2	300.0
1973	2	0	6.6	-			-		
1974	-			1	30	2.5	-		
1975	2	2	5.1	-			-		
1976	-			-			1	929	8,000.0
1978	-			2	43	17.5	2	7	3.0
1979	3	0	30.5	-			-		
1980	3	5	23.5	2	2	10.5	2	3,105	20,000.0
1981	-			-			1	12	0.5
1982	-			1	110	10.0	1	0	35.0

[a] - CRITERIA: $1 MILLION + DAMAGES OR 10+ DEATHS OR MAGNITUDE 7.5+
[b] - INDICATES NO SIGNIFICANT EARTHQUAKE RECORDED

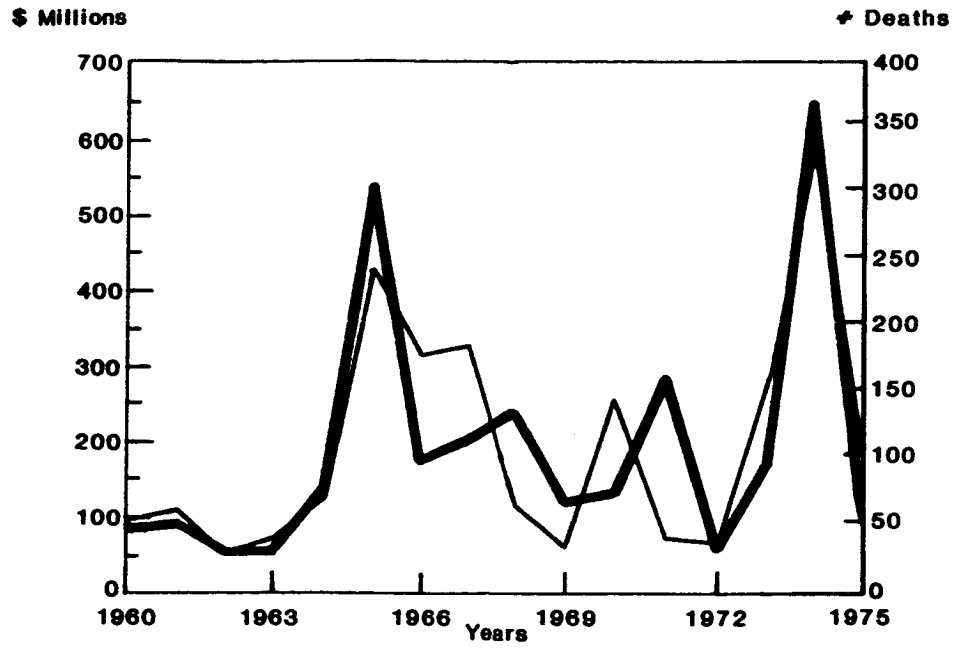
SOURCE: CATALOG OF SIGNIFICANT EARTHQUAKES

the data from other nations. Therefore, the discussion of climatological events will be limited to the U.S. with its wide variety of climatic regimes, land mass, and inherently severe weather phenomena.

Figures 2-11 through 2-15 present historical data for the five major climatological disasters; Figure 2-16 presents historical data for all climate events; and Figures 2-17 and 2-18 present a comparison of total deaths and damage by each event. Flooding accounts for the most destruction, both in lives lost and property damage; and lightning is the second highest killer, followed closely by tornadoes. In terms of property damage, hurricanes are the second highest cause of damage followed by tornadoes. It should be noted, however, that the data for hurricanes include any storm between the U.S. and Africa, including part of the Caribbean. A major result of hurricanes is flooding. Since the data for each of these climatic events is derived from various sources, the property loss estimates from hurricanes probably include flood damage as well. This suggests that flooding is an even greater problem, followed by tornadoes, in terms of physical damage.

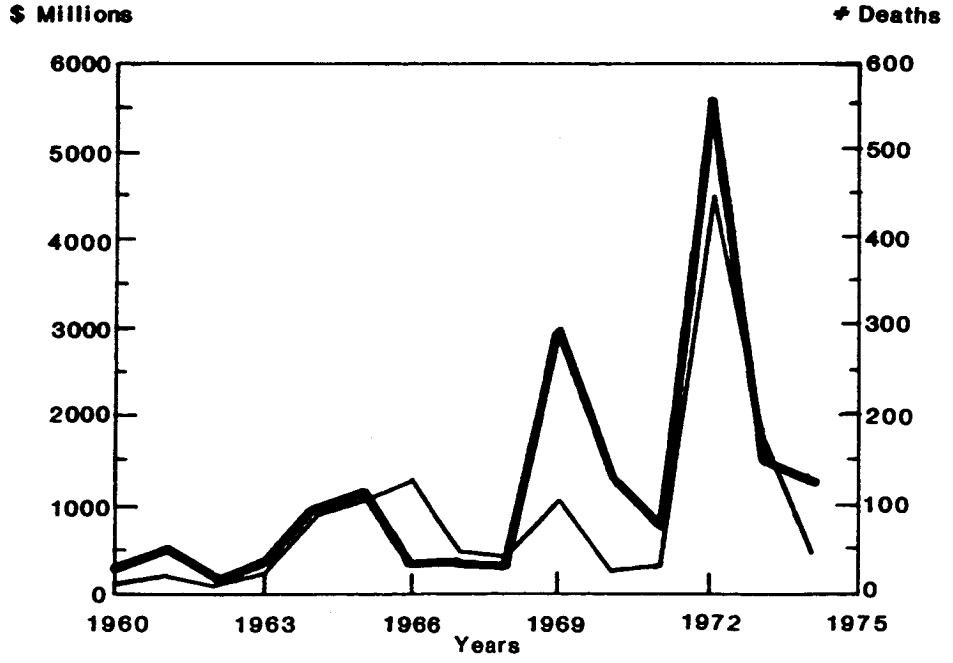
Figure 2-19 presents major crop damage and losses for three major crops resulting from temperature extremes, drought and severe or premature cold. Drought accounts for roughly one-half of crop losses annually, with frost accounting for 4 to 13%. Damage from excess moisture, floods and wind have already been accounted for in the statistics used for Figures 2-11 to 2-14.

The only data available for human losses resulting from extreme temperatures are reports from the Senate and House Committees on Aging. It is estimated that two national heat waves between 1963 and 1966 killed over 11,000 people. In the recent 1980 heat wave preliminary estimates indicate over 10,000 heat related fatalities. The other extreme, cold weather, causes an estimated 25,000 deaths annually from hypothermia; the primary persons affected are the elderly.



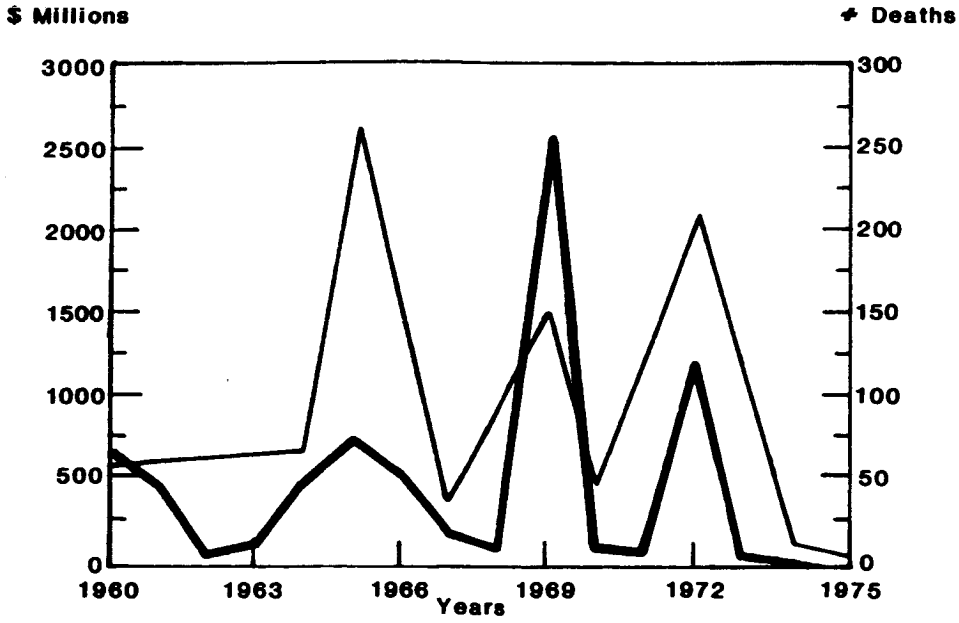
Source: NOAH, Tornado Forecast Center, 1984

Figure 2-11. Tornadoes



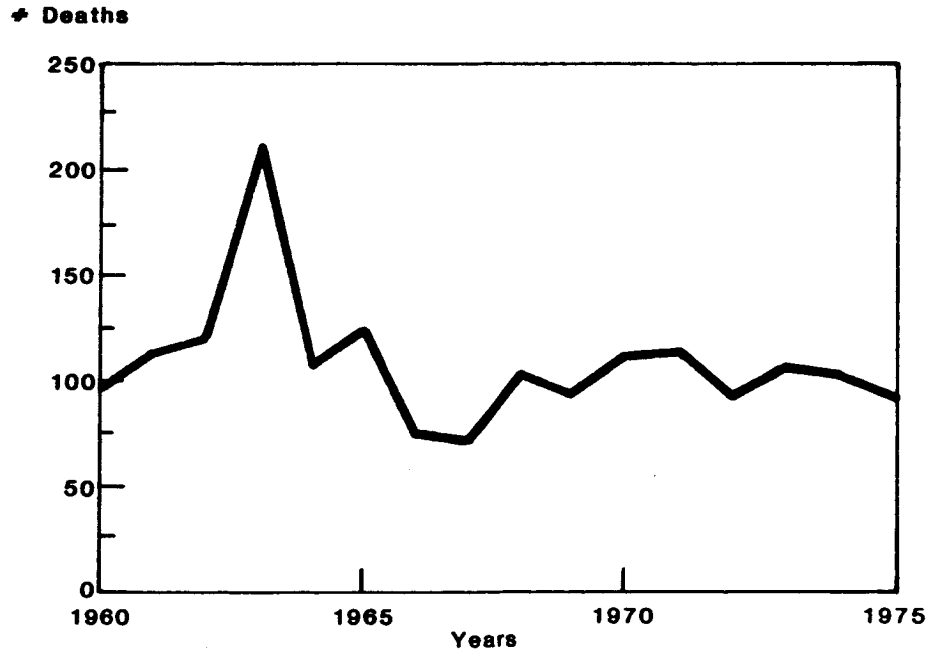
Source: The Weather Almanac, 1981

Figure 2-12. Floods



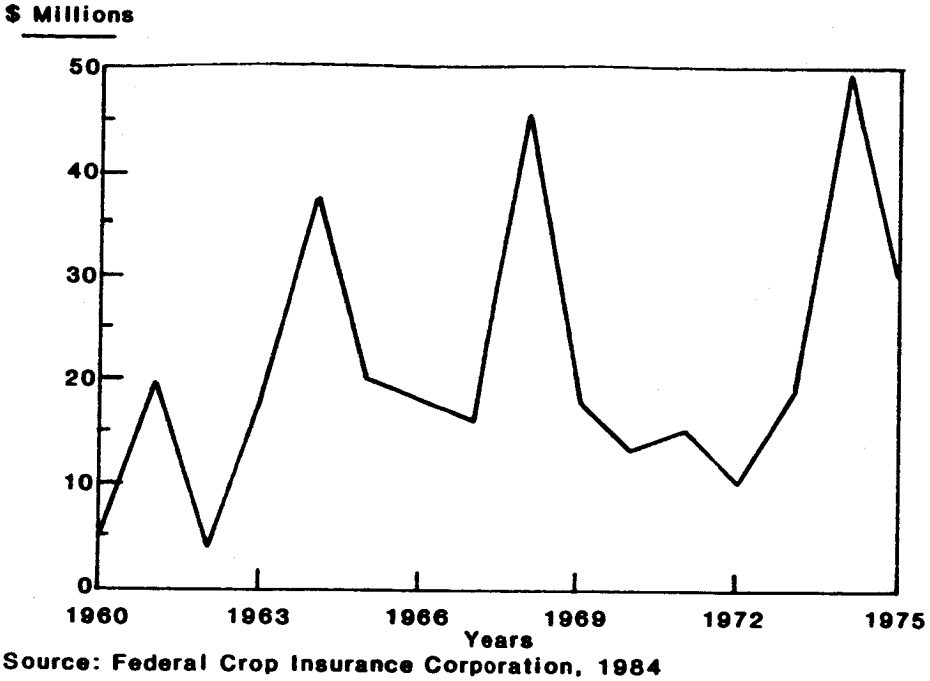
Damage estimates based on 15 most costly hurricanes
Source: NOAH, National Climatic Data Center, 1984

Figure 2-13. Hurricanes



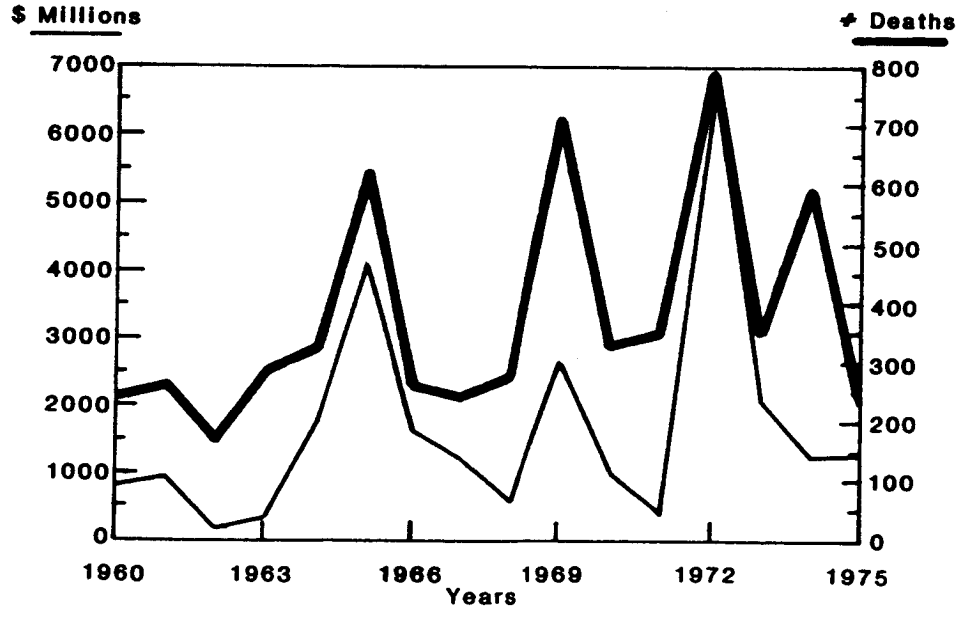
Source: NOAH, National Climatic Data Center

Figure 2-14. Lightning



Source: Federal Crop Insurance Corporation, 1984

Figure 2-15. Extreme Temperatures



—Based on 1972 dollars

▬Deaths due to temperature related events are not included

Figure 2-16. All Climate Events

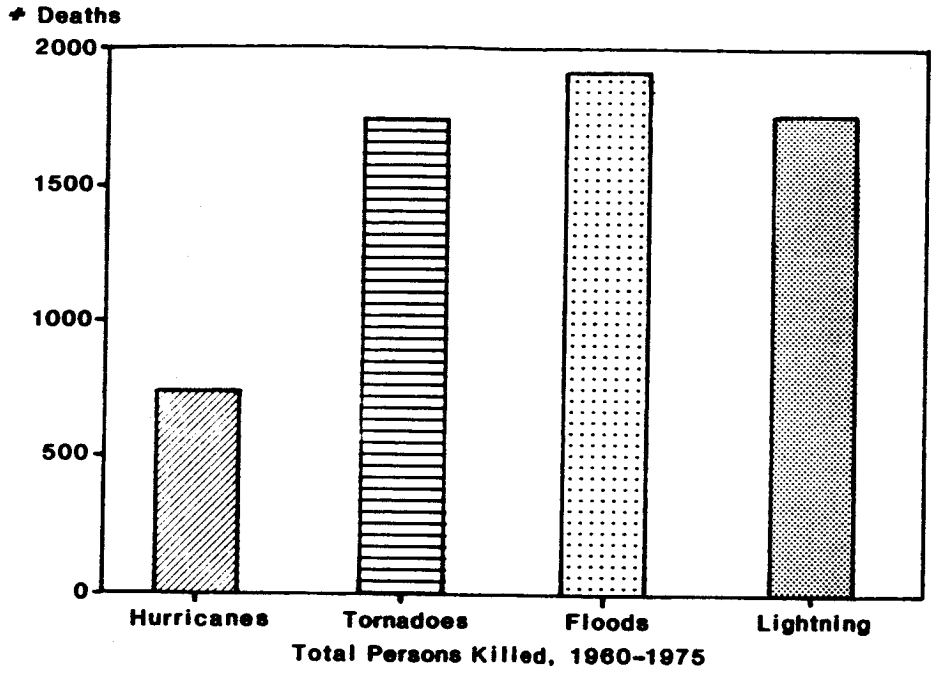


Figure 2-17. Total Deaths by Climatological Violence

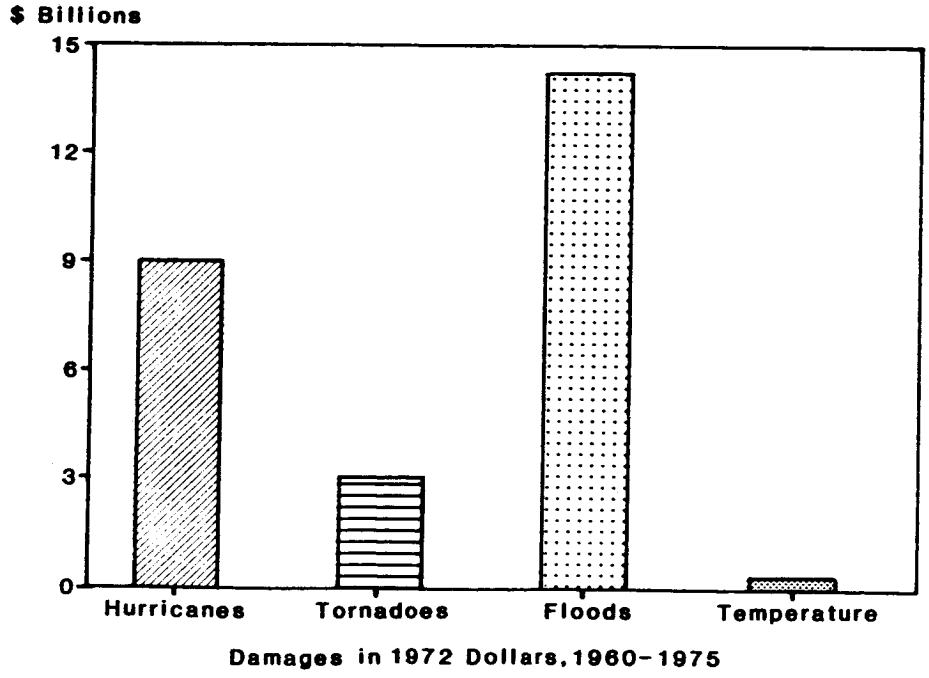
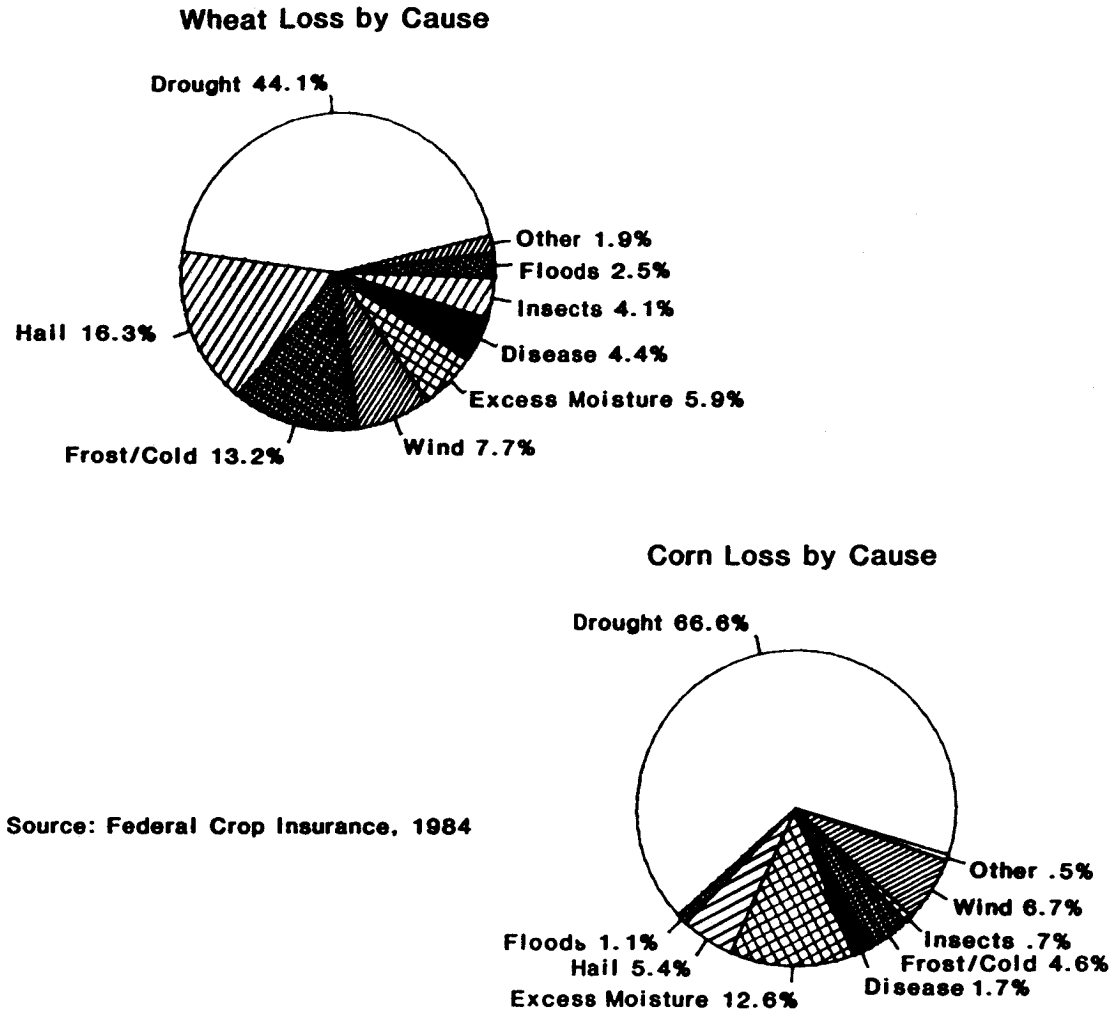


Figure 2-18. Total Damage by Climatological Violence



Source: Federal Crop Insurance, 1984

Figure 2-19. Annual Average Losses by Cause for Three Major Crops

Biological Violence

The third category of natural violence, biological, includes deaths and damages caused by the wide variety of pests (animals, insects and microorganisms) that cause diseases. These pests affect food production and storage, buildings and other structures, and general public health.

The primary available indicators of biological violence are damages caused by insects and plant disease causing organisms. Specific damage includes crops eaten by insects, deer and birds, buildings contaminated by pigeons and starlings, and a wide range of human diseases transmitted by rats, cockroaches, flies and tics. Most of this damage has not been statistically quantified and is therefore excluded from this discussion.

Three effects of biologic violence are germane to this discussion:

- Crop losses due to insects and disease.
- Money spent controlling insects and disease.
- Estimates of damage done by termites.

Figure 2-19 presents annual average losses by cause for three major U.S. crops--wheat, corn and soybeans--based on insurance claims paid by the Federal Crop Insurance Corporation (FCIC). Damage is kept to a minimum because of the tons of pesticides used annually to keep the insects and disease in check. It is estimated that post-harvest pest control reduces food losses from pests to 9% in the U.S., compared to the 40 to 50% losses attributed to pests in developing nations. Table 2-18 provides data on pesticide use in the U.S.

TABLE 2-18

U.S. GOVERNMENT EXPENDITURES FOR PEST CONTROL, 1980 ($ MILLION)

MANAGEMENT SYSTEMS	RESEARCH	TECHNOLOGY TRANSFER	IMPLEMENTATION	ASSISTANCE	TOTAL
AGRICULTURE	104.96	10.95	49.03	—	164.94
FORESTRY	33.92	9.83	61.51	7.10	112.36
RANGELAND	1.79	3.91	6.58	0.90	13.18
RIGHTS-OF-WAY	2.23	0.06	13.40	--	15.69
URBAN	4.57	2.97	127.04	—	134.58
PUBLIC HEALTH	6.42	2.69	81.44	—	90.55
OTHER[a]	24.50	0.21	136.72	—	161.43
TOTAL[b]	**178.39**	**30.62**	**475.72**	**8.00**	**692.73**

SYNTHETIC ORGANIC PESTICIDES—PRODUCTION AND SALES: 1960 TO 1981

ITEM	1960	1965	1970	1975	1976	1977	1978	1979	1980	1981
PRODUCTION TOTAL (MILL LB)	648	877	1,034	1,603	1,364	1,388	1,416	1,429	1,468	1,430
HERBICIDES	102	263	404	788	656	674	664	657	806	839
INSECTICIDES	366	490	490	660	566	570	605	617	506	448
FUNGICIDES	179	124	140	155	142	143	147	155	156	143
PRODUCTION VALUE[c] ($ MILL)	307	577	1,058	2,900	2,880	3,116	3,342	3,685	4,269	5,146
SALES TOTAL (MILL LB)	570	764	881	1,137	1,193	1,263	1,300	1,369	1,406	1,291
SALES VALUE[c] ($ MILL)	262	497	870	2,359	2,410	2,608	3,041	3,631	4,078	4,652

[a] RESOURCES THAT CANNOT BE ASSIGNED TO A SINGLE MANAGEMENT SYSTEM (e.g., PESTICIDE REGISTRATION, ENFORCEMENT, AND TOXICOLOGY RESEARCH).

[b] DOES NOT INCLUDE APPROXIMATELY $106 MILLION EXPENDED BY STATE INSTITUTIONS FOR PEST MANAGEMENT RESEARCH AND $35 MILLION BY STATE AND COUNTY EXTENSION SERVICES FOR TECHNOLOGY TRANSFER.

[c] MANUFACTURERS UNIT VALUE MULTIPLIED BY PRODUCTION.

SOURCE: U.S. DEPARTMENT OF AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE, THE PESTICIDE REVIEW, 1981. BASED ON DATA FROM U.S. INTERNATIONAL TRADE COMMISSION, SYNTHETIC ORGANIC CHEMICALS, ANNUAL.

In general, the overall impact of biological violence on the U.S. economy is substantial in terms of money spent on pesticides to reduce crop losses, and damages to buildings caused primarily by termites. Rodents and insects carrying and transmitting human diseases are also a threat to public health, but their effect has been minimized through medicines, vaccines and improved public sanitation.

Technological Mitigation of Natural Violence

Most natural violence is not readily amenable to preventive or control technology. Although there has been some speculation on pumping water into fault fractures and seeding clouds, these natural processes are not well enough understood to be adequately controlled. The possibility of triggering a major earthquake, or causing rain in one area and a resulting drought in another, are two very likely outcomes of such environmental manipulation.

The primary thrust of current and future technologies is in monitoring, detection and follow-up disaster relief efforts. Potential research and development will be discussed for each of the three main types of natural violence.

Geological--In 1977 Congress established the National Earthquake Hazards Reduction Program (NEHRP) to provide a comprehensive, integrated plan to reduce life and property losses from earthquakes. The key participating government agencies, FEMA, USGS, NSF and the National Bureau of Standards, are tasked to participate in coordinating and conducting earthquake research, hazard mitigation and disaster preparedness. Some specific mitigation measures include:

- Prediction through an understanding of geological precursory activity, such as changes in well water and seismic activity.

- Hazard assessment and land use planning, i.e., the prevention of major constructions such as dams, bridges, power plants, and high rise buildings, in hazard areas.

- Enforcement of building codes which will produce better engineering techniques that provide more earthquake resistant structures.

The application of these measures to earthquakes is at various stages of development. Prediction and control techniques are still far from being perfected. Hazard evaluation and engineering design are fairly well-developed and are currently being applied to several hazard prone areas. Other techniques, such as mapping of major active faults, are semi-developed for some regions (for example, the San Andreas fault in California), and are being considered for land use planning. The following systems have been developed, field tested and are ready for use: short-period seismometer and telemetry systems, tiltmeters, magnetometers, gravimeters, some types of strainmeters, water-level records, digital telemetry systems, laser distance-ranging systems and classical surveying techniques. For other technologies, the era of significant diffusion is still remote. These include: systems to measure deep electrical resistivity, telluric currents, geochemical parameters and stress, some kinds of strainmeters, multicolor laser-ranging systems, and other proposed instrumental and observational systems.

Mitigation measures for volcanoes are basically the same as those for earthquakes, i.e., hazard assessment, monitoring, and emergency-response planning. Geologists have been more successful in predicting volcanoes than earthquakes. Mount St. Helens provides a dramatic example; since May 25, 1980, all 16 of its eruptions were accurately predicted, probable hazard zones were established, and evacuation measures saved hundreds of lives.

Moreover, many of the aforementioned technologies for monitoring earthquakes are also applicable to volcano monitoring. Small earthquakes are often precursors to volcanic eruptions, and monitoring of ground movement is essential to prediction. Other areas of volcano monitoring include: recording and analyzing variations in gas composition, deviations in local and magnetic fields indicating pressure and stress caused by subterranean magma movement, measuring changes in slope with electromechanical tiltmeters, measuring horizontal distances with laser beams, and using aerial infrared surveys to measure thermal changes.

A global monitoring system for both earthquakes and volcanoes, using satellite and laser technologies, is currently under consideration by NASA. Two of the basic applications of this system are described below:

- **Proposed Volcano Monitoring System**--Laser reflectors are put in small cubes that can be widely dispersed in tectonically active areas or near volcanoes. As a satellite passes, it bounces a beam off each cube; detection of the minute movements of the cubes indicates seismic activity. Depending on the amount of activity, a more complete, thorough assessment, using finer measuring techniques, could be conducted. These cubes could provide a valuable warning system in remote areas such as Alaska, where earthquakes often trigger tsunamis. Another application of this system would be in land surveying; placing cubes on established boundary markers and measuring distances can be done much more accurately with laser beams than with classical surveying techniques.

- **Satellite Relaying System**--Currently most monitoring instruments continuously record data which are stored. These data are periodically checked and analyzed as much as once a year. In a satellite relay

system there would be minimal time delay and significant readings could be acted upon immediately rather than after the fact.

For climatological violence, the technological emphasis is on monitoring and prediction rather than on control. Most severe weather events, such as tornadoes, have been based on actual visual sightings, leaving little time to evacuate or prepare. The National Weather Service is anticipating near-term use of a Doppler radar system (NEXRAD) that would provide warning information well in advance of actual occurrences. Other technologies include use of lasers (lydar) and sound waves for probing the atmosphere to test stability parameters, wind profiles and temperature gradients. In addition, refinements in satellite imagery techniques are expected to provide finer, more detailed and widespread data for mesoscale modeling and forecasting.

Biological mitigation technology involves both monitoring and control measures. Some examples follow:

- **Monitoring**--This entails the remote sensing of environmental conditions to determine when and where major pest outbreaks may occur so that control technologies can be applied. Improvements on radar and lydar are also future techniques to be used to monitor pest populations and movements.

- **Chemical Communication Systems**--Research is being done using pheromones to "jam" insect communications, disrupt breeding patterns and eliminate environmental cues from host species.

- **Genetic Control**--Through radiation and genetic engineering, sterile or nonviable hybrids are created that will cause the population to crash when introduced in large numbers; more resistant plant species are also created.

- **Species Specific Control**--Many of the pesticides in use today result in overkill, eliminating more than just the target population. Work is being done to develop very specific pesticides with limited effects. Another area of research is biological control, in which one organism is used to control another.

A broader, more futuristic goal is to apply pest management on a much larger scale. For example, the fall army worm winters in Mexico, then moves throughout the southern U.S. To effectively eradicate the fall army worm would require the application of control measures on a large, regional basis, i.e., both in Mexico and the U.S.

Conclusion

Geological events represent the least serious category of natural violence in the long-term. However, one disastrous geological event is potentially most devastating in the short-term. Severe climatological disasters generally take the greatest toll in human lives on a yearly basis, while biological damage to property (primarily from termites) in one year far outweighs the damage done by severe weather in the 15 years examined.

The U.S. posture with respect to natural violence is comparable to and possibly worse than other countries. The land mass of the U.S. is large enough for severe weather events to affect large portions of the population. In addition, since the U.S. is also a major producer of the world's food, insect damage to crops has proportionately more serious consequences.

C.2.5 PROTECTION AGAINST FINANCIAL DEPRIVATION

Relief from financial deprivations has been available in the forms of charity and benevolences for most of recorded history.

The earliest national form of social security, adopted in 1883 by Germany, was for work-related accidents. By the 1920s National Unemployment Insurance became an international concern; the depression of the 1930s reinforced that concern. The U.S. introduced work injury laws in 1908 and 1911 and the Social Security Act of 1935, which initially covered old age pensions for industrial and commercial workers, and disability and compulsory unemployment insurance. Currently, developed countries make financial security an integral part of their socioeconomic structure.

Table 2-19 shows the types of social security and historic rate of adoption by developing countries.

Financial deprivation generally resolves into two categories:

- Involuntary loss of employment through poor health, disability or socioeconomic conditions;

- The mandatory loss of employment through "normal" retirement or health deterioration.

The key indicators for both of these categories are: 1) the government's expenditures as percent of GDP and per capita GDP for social benefit programs, and 2) the number of individuals of advanced age in the population. Figure 2-20 and Table 2-20 compare the key indicators of financial deprivation and expenditures for social security among selected countries.

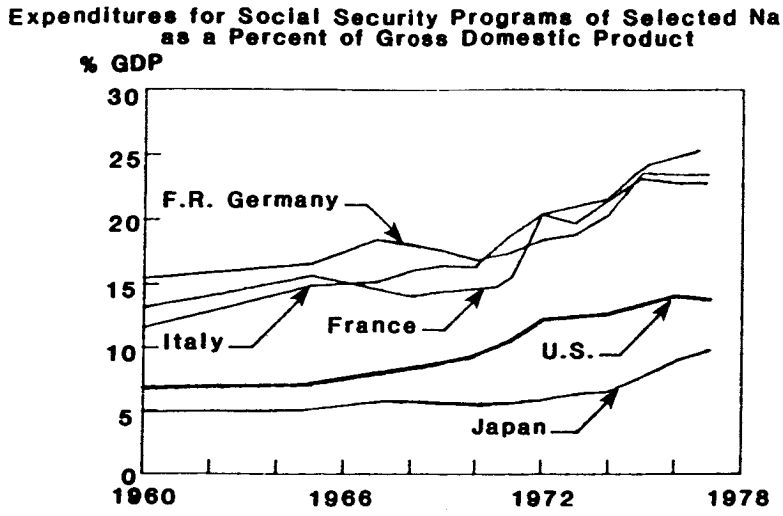
Differences in receipts and exenditures for the social security systems of the U.S. and comparative countries are shown in Table 2-21. Each country has increased its social security expenditures; however, Japan has notably doubled its expenditures while maintaining the surplus percentage rate, while the U.S. has decreased its surplus and will eventually follow F.R. Germany in drawing on a deficit.

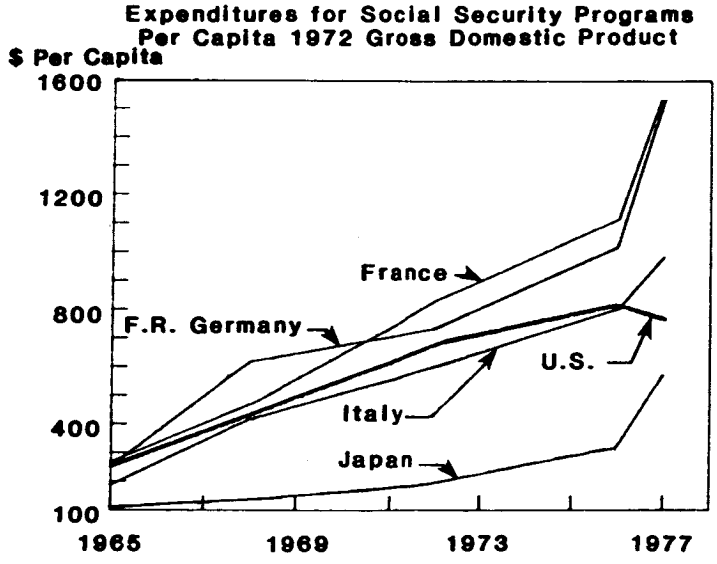
TABLE 2-19

SOCIAL SECURITY BENEFITS ADOPTED BY DEVELOPED COUNTRIES (CUMULATIVE TOTALS)

YEAR	OLD AGE, INVALIDITY, DEATH	SICKNESS, MATERNITY	WORK INJURY	UNEMPLOYMENT	FAMILY ALLOWANCE
1900	5	8	12	0	0
1910	11	10	20	3	0
1920	18	18	40	9	0
1940	38	34	87	22	8
1950	54	52	111	27	34
1960	82	86	120	35	63
1970	110	104	127	38	65
1979	124	114	131	43	69

Source: DEPARTMENT OF HEALTH AND HUMAN SERVICES, SOCIAL SECURITY PROGRAMS THROUGHOUT THE WORLD, RESEARCH REPORT NO. 54 (1980)





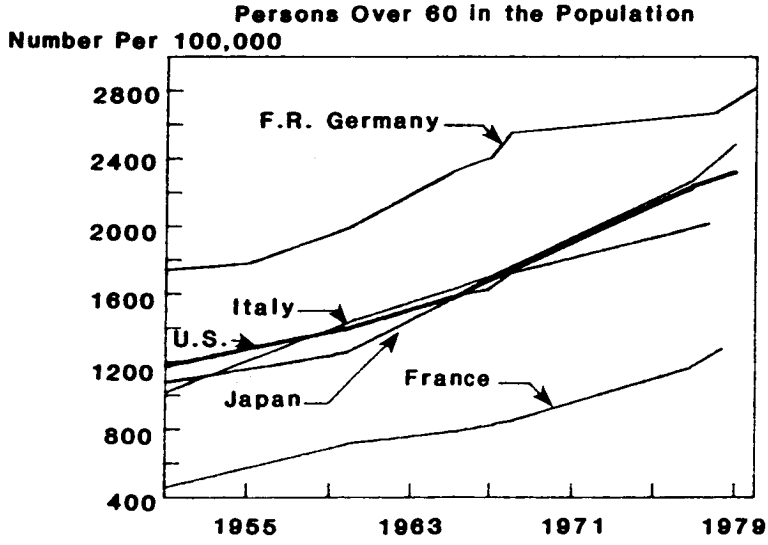


Figure 2-20. Key Indicators of Financial Deprivation

TABLE 2-20

EXPENDITURES FOR SOCIAL SECURITY PROGRAMS
AS A PERCENT OF GROSS DOMESTIC PRODUCTION

	U.S.	JAPAN	F.R. GERMANY
1960	6.8	4.9	15.5
1965	7.1	5.1	16.5
1970	9.4	5.5	16.8
1975	13.2	7.6	23.5
1977	13.7	9.7	23.4

SOURCE: INTERNATIONAL LABOR OFFICE, GENEVA, THE COST OF SOCIAL SECURITY 1967-71, 1960-74, 1975-77

Table 2-22 categorizes the U.S. social security expenditures for involuntary unemployment. The dramatic increases in these expenditures, with the exception of veterans training, education and rehabilitation, have reached a level where the social security receipts will not be sufficient to cover the needs of society.

Developed countries have followed F.R. Germany's lead and written qualifications and payment of benefits guidelines for the sick, elderly, unemployed, and disabled. Since the U.S. implemented social security, few drastic changes have been made to these guidelines. However, industry has begun to bear some of the burden of these benefits for its employees. Company benefits have become a major employment factor and now include short and long-term disability, paid vacations, health insurance, retirement and various other amenities such as dental care and IRA payments.

Table 2-23 describes the basic national old age invalidity and death coverage for the U.S., compared to Japan, a country

TABLE 2-21

THE COST OF SOCIAL SECURITY
(BILLIONS OF U.S. $)

TOTAL RECEIPTS (BILLION U.S. $)

	1965	1970	1975	1977
U.S.	55.9	126.6	219.9	280.5
JAPAN	535.8	1,614.3	4,790.8	10,037.6
F.R. GERMANY	19.8	37.5	98.1	118.7

TOTAL EXPENDITURES (BILLIONS OF U.S. $)

	1965	1970	1975	1977
U.S.	48.8	112.8	202.2	259.5
JAPAN	414.9	1,142.7	3,479.3	7,777.4
F.R. GERMANY	19.1	36.0	99.1	120.6

SURPLUS AS A PERCENT OF TOTAL RECEIPTS

	1965	1970	1975	1977
U.S.	+12.7	+10.9	+8.1	+7.5
JAPAN	+22.6	+30.1	+27.4	+22.5
F.R. GERMANY	+ 3.5	+ 3.9	- 1.0	- 1.6

SOURCE: INTERNATIONAL LABOR OFFICE, GENEVA,
THE COST OF SOCIAL SECURITY
TENTH INTERNATIONAL INQUIRY 1967-1977

TABLE 2-22

U.S. SOCIAL SECURITY EXPENDITURES

FOR INVOLUNTARY LOSS OF EMPLOYMENT (1972 BILLION $)

	1975	1978	1980	1983
INFIRMITY				
• GENERAL HEALTH CARE	12.9	18.5	23.1	28.7
• VETERANS HEALTH CARE	3.7	5.3	6.5	8.3
• VETERANS DISABILITY	24.5	9.7	11.7	14.3
TOTAL	41.1	33.5	41.3	46.9
SOCIOECONOMIC				
• UNEMPLOYMENT	13.5	11.8	18.0	31.5
• AFDC, CSE, SSI	10.1	13.9	17.2	21.1
TOTAL	23.6	25.7	35.2	52.6
INABILITY TO AFFORD				
• HOUSING ASSISTANCE	2.1	3.7	5.5	9.6
• FOOD ASSISTANCE	6.6	8.9	14.0	18.0
• VETERANS TRAINING, EDUCATION, AND REHABILITATION	4.6	3.4	2.3	1.6
• GENERAL EDUCATION	15.9	26.5	30.8	26.6
TOTAL	29.2	42.5	52.6	55.8

TABLE 2-23

OLD AGE, INVALIDITY AND DEATH PENSION
(1981)

	JAPAN	U.S.	F.R. GERMANY
	1ST LAW--1941 CURRENT--1954 (EMPL. PENSION) 1959 (NAT. PENSION) DUAL SOCIAL SYSTEMS	1ST AND CURRENT LAW--1935 AMENDED--1981 SOCIAL INSURANCE SYSTEM	FEDERAL REPUBLIC SOCIAL INSURANCE SYSTEM
COVERAGE:	EMPLOYEES PENSION INSURANCE FOR FIRMS WITH 5 OR MORE EMPLOYEES. NATIONAL PENSION--ALL ADULTS NOT UNDER OTHER PROGRAMS.	GAINFULLY EMPLOYED PERSONS, EXCLUSIONS MADE. VOLUNTARY COVERAGE FOR EMPLOYEES OF: NONPROFIT INSTITUTIONS, STATE AND LOCAL GOVERNMENTS AND CLERGYMEN. SPECIAL SYSTEMS FOR RAILROAD, FEDERAL, AND SOME STATE AND LOCAL GOVERNMENT EMPLOYEES.	EMPLOYED, APPRENTICES, AND UNEMPLOYMENT BENEFICIARIES. SEPARATE SYSTEMS FOR WAGE EARNERS AND SALARIED EMPLOYEES, WITH IDENTICAL PROVISIONS. SPECIAL SYSTEMS FOR SELF-EMPLOYED AND SPECIFIC LABOR CATEGORIES. VOLUNTARY AFFILIATION FOR OTHERS PREVIOUSLY OR CURRENTLY EXEMPT FROM COMPULSORY INSURANCE.
SOURCE OF FUNDS:	EMPLOYEES PENSION INSURANCE--5.3% (MEN), 4.5% (WOMEN) EMPLOYERS 5.3% (MEN), 4.5% (WOMEN) OF PAYROLL. GOVERNMENT--20% BENEFIT COST. CONTRIBUTION--45,000 - 410,000 YEN/MONTH ($20.70 U.S.) EMPLOYER CONTRIBUTION NON-GOVERNMENT SUBSIDY--33.3% OF BENEFITS PAID DURING THE YEAR.	INSURED PERSON--5.35% EARNINGS, SELF-EMPLOYED 8.0%. EMPLOYER--5.35% OF PAYROLL MAXIMUM EARNINGS FOR CONTRIBUTION AND BENEFIT--$29,700/YEAR. AUTOMATIC INCREASE ADJUSTED TO WAGE LEVELS.	INSURED--9.25% OF EARNINGS 18.5% FOR SELF-EMPLOYED. EMPLOYER--9.25% OF PAYROLL GOVERNMENT--ANNUAL SUBSIDY (14% OF TOTAL COST OF PENSION INSURANCE PLUS 18% OF INSURED CONTRIBUTION DURING MATERNITY LEAVE OR UNEMPLOYMENT) EARNINGS FOR CONTRIBUTION--4,800 DM--52,800 DM/YEAR ($2,208--$24,288 U.S.)
QUALIFIERS:	EMPLOYEE OLD AGE PENSION INSURANCE--60 (MEN), 55 (WOMEN), 20 YEARS COVERAGE. REDUCED 20-80% IF NO RETIREMENT, AND EARNING EXCEED 42,000 YEN/MONTH ($193 U.S.) UNTIL AGE 64; AGE 65-70 REDUCED TO 20% IF NO RETIREMENT. NATIONAL PENSION PROGRAM--AGE 65, 5-25 YEARS CONTRIBUTION, PAYMENT FOR 60-70 WITH ACTUARIAL DEDUCTIONS AND INCREASES. INVALIDITY PENSION--TOTAL INCAPACITY AND AND 6 MONTHS COVERAGE; PARTIAL PENSION IF 70% INCAPACITY; LUMP SUM IF 30-69%.	OLD AGE--AGE 65 (62-64 WITH REDUCTION), INSURED-ONE-QUARTER OF COVERAGE (QC) FOR EACH YEAR SINCE 1950 TO AGE 62, MAXIMUM 40 QC. PENSION REDUCED $1 FOR EVERY $2 EARNED ABOVE $5,000 A YEAR A YEAR UNTIL AGE 72. INVALIDITY--IF IMPAIRMENT IS INCURABLE OR 1-YEAR PROGNOSIS 1 QC FOR EACH YEAR SINCE 1950 (SINCE AGE 21) MAXIMUM 40 QC. REDUCED REQUIREMENT FOR YOUNG OR BLIND. SURVIVOR--DECEASED WAS PENSIONER OR 1 QC FOR EACH YEAR SINCE 1950, MAXIMUM 40 QC. REDUCED FOR ORPHANS 6 QC IN 13 QUARTERS PRECEDING MONTH.	OLD AGE--AGE 63 WITH 35 YEARS OF INSURANCE OR 65 WITH 15 YEARS. PAYABLE AT 60 IF UNEMPLOYED 1 YEAR IN LAST 18 MONTHS, OR WOMEN WITH 10 YEARS INSURANCE IN LAST 20, OR DISABLED AT 60, AND 35 YEARS OF CONTRIBUTION. PARTIAL RETIREMENT NECESSARY TO 65 (WORK AND DECREASED BENEFITS FROM 60-65). INVALIDITY--GENERAL INVALIDITY OR 50% REDUCTION IN EARNINGS CAPACITY IN USUAL OCCUPATION (60 MONTHS CONTRIBUTION). MINIMUM INCOME PENSION--25 YEARS INSURED EMPLOYMENT. SURVIVOR--DECEASED HAD 60 MONTHS CONTRIBUTION OR WAS PENSIONER OR WAS PENSIONER AT DEATH.
CASH BENFITS FOR INSURED, NOT PERMANENT DISABILITY:	EMPLOYEES PENSION INSURANCE--MONTHLY PENSION EQUAL TO (FOR UP TO 35 YEARS) YEARS OF COVERAGE TIMES THE TOTAL 2,050 YEN ($9.43 U.S.); REVALUED AVERAGE LIFTIME MONTHLY EARNINGS. DEPENDENTS SUPPLEMENTS--15,000 YEN/MONTH ($69 U.S.) MONTH FOR SPOUSE.	OLD AGE--MAXIMUM $677/MONTH BASED ON COVERED EARNINGS FROM 1950 TO RETIREMENT OR DEATH. INCREMENTS OF 1/12% FOR EACH MONTH IF DELAYED RETIREMENT AT 65-71 YEARS. AUTOMATIC COST OF LIVING ADJUSTMENTS--SPECIAL MINIMUM FOR SERVICE IN EXCESS OF 10 YEARS. DEPENDENT ALLOWANCE	OLD AGE--1.5% OF ASSESSED WAGES TIMES YEARS OF INSURANCE (INCLUDES CREDITED PERIODS OF INCAPACITY, UNEMPLOYMENT, SCHOOLING AFTER 16). DEFERRED INCREMENT: 0.6%/MONTH WORKED 65 AND 67. CHILD SUPPLEMENT--SEE INVALIDITY QUALIFIER. ADJUSTMENTS OF PENSION--SEE INVALIDITY QUALIFIER.

TABLE 2-23 (CONTINUED)

CASH BENEFITS FOR INSURED, NOT PERMANENT DISABILITY (CONTINUED):	5,000 YEN/MONTH ($23 U.S.) 1ST AND 2ND CHILD 2,000 YEN/MONTH ($9.20 U.S.) FOR EACH OTHER CHILD. NATIONAL PENSION PROGRAM--1,680 YEN/ MONTH ($7.73 U.S.) OF CONTRIBUTION. MINIMUM AT 70, 22,500 YEN/MONTH ($103.50 U.S.). AUTOMATIC COST OF LIVING ADJUSTMENTS FOR BOTH PROGRAMS. INCOME TESTED ALLOWANCE-- UP TO 22,500 YEN/MONTH ($10,350 U.S.) ACCORDING TO OTHER INCOME.	50% TO SPOUSE AGE 65 OR ANY AGE IF CARING FOR CHILD UNDER 16 OR INVALID; TO EACH CHILD OR DEPENDENT GRAND-CHILD UNDER 18. MAXIMUM FAMILY PENSION-- BASED ON BASIC PENSION $1,185 PER MONTH. SPECIAL MONTHLY BENEFIT-- TO PERSONS OVER 72 BEFORE 1968 NOT RECEIVING FROM OTHER PUBLIC SOURCES. MEAN-TESTED ALLOWANCE--PAYABLE TO NEEDY AGED.	
SURVIVOR BENEFITS AND MEDICAL FOR DEPENDENTS:	EMPLOYEES PENSION INSURANCE--50% OLD AGE PENSION, TO INSURED, MINIMUM 41,800 YEN/MONTH ELIGIBLE--SPOUSE, PARENTS OR GRANDPARENTS OVER 60, ORPHANS AND GRAND-CHILDREN UNDER 18. DEPENDENT SUPPLEMENTS-- 10,000 YEN FOR 1 CHILD 17,500 YEN FOR 2 OR MORE.	SURVIVOR--100% AT 65, REDUCED IF INVALID AT AGE 50; TO SPOUSE; 75% FOR SPOUSE AT ANY AGE CARING FOR CHILD UNDER 16 OR INVALID. ORPHANS--75% FOR EACH CHILD UNDER 18. DEPENDENT PARENT(S)--82.5% AT 62 OR 150% FOR 2 ELIGIBLE PARENTS. MAXIMUM FAMILY PENSION-- BASED ON PENSION TO $960.	SURVIVORS--10% OF GENERAL PLUS DM 152.90 PER MONTH OR 20% IF FULL ORPHAN PLUS 10% OF MONTHLY GENERAL BASE FOR EACH CHILD UNDER 18. PAYABLE TO ORPHAN 18-25 IF AN APPRENTICE AND INCOME DM 1,000/MONTH ($460 US). MAXIMUM SURVIVOR--100% OF GENERAL INVALIDITY PENSION OF INSURED. DEATH GRANT (UNDER SICKNESS INSURANCE)--LUMP SUM OF 20-40 DAYS EARNINGS, DM 100-4,200.
SURVIVAL BENE-FITS & MEDICAL FOR DEPENDENTS (CONT'D):	NATIONAL PENSION PROGRAM SURVIVOR-WIDOW-60-65 50% PENSION. WIDOWED MOTHER--41,800 YEN/MONTH PLUS 5,000 YEN/MONTH FOR 1ST CHILD. FULL ORPHANS--MINIMUM 41,800 YEN/MONTH PLUS 5,000 YEN FOR 1ST CHILD, 2,000 YEN FOR OTHER CHILDREN. INCOME-TESTED ALLOW--UP TO 29,300 YEN/MONTH FOR WIDOWED MOTHER 5,000/2,000 YEN FOR 1ST AND OTHER CHILDREN, ACCORDING TO INCOME. FUNERAL GRANTS--LUMP SUM 23,000 52,000 YEN ACCORDING TO YEARS CONTRIBUTION IF INELIGIBLE FOR PENSION BUT MORE THAN 3 YEARS CONTRIBUTIONS.	MEAN TESTED ALLOWANCE--UNDER FEDERAL STATE PROGRAM TO NEEDY ORPHANS AND RELATIVES WITH WHOM LIVING.	($46 - 9,132 U.S.). LOWER RATE FOR PENSIONERS (UP TO DM 2,493) OR FAMILY MEMBER (UP TO DM 2,000).

that spends the least (as % of GDP) on social security programs and F.R. Germany, a country that spends the most on such programs. The better quality of care and higher expenditures in Japan reflect the higher societal importance placed on family and care.

Table 2-24 compares the "standard" government social security coverage for work injury. Though safety measures and equipment are continually stressed and improved, they do not prevent accidents and injuries.

Medical technology and health care for the assistance of the sick and handicapped are covered under Section C.1.

Socioeconomic conditions and changing job requirements produce high levels of unemployment in developed countries. The standard unemployment social security guidelines, shown in Table 2-25, are an attempt to aid the unemployed until new employment is found. In the event of prolonged unemployment, the U.S. government continually attempts to provide newer, better methods of assisting the impoverished by providing housing assistance, government training or employment programs, food stamps and medical aid.

The U.S. provides no consistent unemployment and work injury coverage or benefits for its states. Working with the same financial base, each state varies its payments, coverage and allocations to the individual. Coverage is not a percentage of individual income or of the state's economy. Since training and retraining provisions are not included in the U.S. system, these conclusions may be drawn:

- The U.S. system of financial security does not provide for the recovery of a person or the economy.

TABLE 2-24

WORK INJURIES SOCIAL SECURITY
(1981)

	JAPAN 1ST LAW—1911 CURRENT—1947 COMPULSORY	UNITED STATES 1ST LAW: 1908 (FEDERAL EMPLOYEES) CURRENT: 4/5 ENACTED BEFORE 1920. COMPULSORY WITH PUBLIC OR PRIVATE CARRIER	GERMANY, FEDERAL REPUBLIC 1ST LAW—1884 (WORK ACCIDENTS) 1925—OCCUPATIONAL DISEASES CURRENT: 1963 COMPULSORY INSURANCE WITH SEMIPRIVATE CARRIER
COVERAGE:	EMPLOYEES OF ALL ENTERPRISES NOT INCLUDED UNDER VOLUNTARY COVERAGE OR SPECIAL SYSTEMS.	EMPLOYEES—IN INDUSTRY AND COMMERCE AND MOST PUBLIC EMPLOYEES; EXCLUSIONS PROVIDED. COMPULSORY IN ALL BUT 3 STATES WHERE ELECTIVE.	EMPLOYED PERSONS SPECIAL SYSTEM FOR PUBLIC EMPLOYEES.
SOURCE OF FUNDS:	INSURED—NONE EMPLOYER—0.5%-12.9% OF PAYROLL. GOVERNMENT—ANY DEFICIT WITHIN LIMIT OF NATIONAL BUDGET.	INSURED—NOMINAL CONTRIBUTION IN A FEW STATES. EMPLOYER—WHOLE COST IN MOST STATES, AND MOST OF COST IN OTHER, THROUGH INSURANCE PREMIUMS. AVERAGE COST IN 1979—1.9% PAYROLL. GOVERNMENT—NONE EXCEPT OWN EMPLOYEES.	INSURED—NONE EMPLOYER—VARY ACCORDING TO RISK, AVERAGE IS 1.5% OF PAYROLL. GOVERNMENT—SUBSIDY TO AGRICULTURAL ACCIDENT INSURANCE FUND AND COVERAGE OF STUDENTS AND CHILDREN IN KINDERGARTEN. MAXIMUM—DM 39,600/YEAR.
QUALIFIERS:	WORK INJURY BENEFITS—NO MINIMUM QUALIFYING PERIOD.	WORK INJURY BENEFITS—NO MINIMUM QUALIFYING PERIOD.	NO MINIMUM PERIOD.
CASH BENEFITS FOR INSURED, EXCEPT PERMANENT DISABILITY:	TEMPORARY (WORK INJURY) 60% OF AVERAGE DAILY WAGE, PLUS SPECIAL SUPPLEMENT OF 20%. MINIMUM 2,185 YEN/DAY PAYABLE—AFTER 3 DAYS (DURING WHICH EMPLOYER PAY 60% OF DAILY WAGE). AUTOMATIC ADJUSTMENT FOR WAGE CHANGES.	TEMPORARY DISABILITY (WORK INJURY) 66 2/3% OF EARNINGS IN MOST STATES. 1/5 OF STATES SUPPLEMENT DEPENDENTS. MAXIMUM—$98-858/WEEK, BY STATE; 4/5 STATES MAXIMUMS INCREASE WITH STATE WAGES. PAYABLE—AFTER 3 OR 7 DAYS WAIT, PAID RETROACTIVELY IF INJURY LASTS A SPECIFIED PERIOD OF 5 DAYS TO 6 WEEKS.	TEMPORARY DISABILITY BENEFIT (WORK INJURY) - SAME AS SICKNESS, INCLUDING PAYMENT BY EMPLOYER; AFTER 6 WEEKS BY THE ACCIDENT INSURANCE FUND PAYABLE - FROM DAY AFTER INJURY UNTIL RECOVERY OR CERTIFICATION OF PERMANENT DISABILITY
PERMANENT DISABILITY AND MEDICAL BENEFITS FOR INSURED:	PENSION—AVERAGE DAILY WAGES TIMES 131-313 DAYS ANNUAL, VARYING BY DISABILITY. SUPPLEMENT—80,000-3,420,000 YEN PLUS SPECIAL BASED ON WORKERS ANNUAL BONUS. LESS SEVERE DISABILITY—LUMP SUM OF 56-503 DAYS WAGES. MEDICAL—INCLUDES TREATMENT, CARE, HOSPITAL AND HOME, DENTAL APPLIANCES, AND TRANSPORTATION.	PENSION (WORK INJURY)—66 2/3% OF ANNUAL IN MOST STATES IF TOTALLY DISABLED. CONSTANT—ATTENDANCE AND DEPENDENTS SUPPLEMENTS PROVIDED IN MOST STATES. MAXIMUM—$98-858/WEEK ACCORDING TO STATE. PAYABLE—FOR LIFE OR THROUGHOUT DISABILITY IN 4/5 OF STATES FOR 330-600 WEEKS OR UP TO $30,000-100,000 IN REST. PARTIAL DISABILITY—PROPORTIONATE TO WAGE LOSS OR FULL RATE FOR FEWER WEEKS IN CASES OF SCHEDULED INJURIES. MEDICAL—PROVIDED AS LONG AS REQUIRED IN ALL STATES.	PENSION (WORK INJURY)—66 2/3% OF LATEST YEARS EARNINGS IF TOTAL DISABILITY. SUPPLEMENT FOR SEVERELY DISABLED (50% INCAPABILITY), WITH NO PENSION—10% OF BASIC PENSION.

TABLE 2-24 (CONTINUED)

SURVIVOR AND MEDICAL BENEFITS FOR DEPENDENTS:	PENSION--35%-67% OF ANNUAL EARNINGS ACCORDING TO NUMBER OF DEPENDENTS PLUS LUMP SUM SUPPLEMENT OF 3,000,000 YEN AND BONUSES. (LUMP SUM IF NO QUALIFIED SURVIVORS). ELIGIBLE SURVIVORS: SEE OLD AGE SURVIVORS. FUNERAL GRANT--185,000 PLUS 30 DAYS AVERAGE WAGES.	PENSION (WORK INJURY) 32 1/2-66 2/3% OF EARNINGS OF INSURED FOR WIDOW, 60-80% FOR WIDOW PLUS CHILDREN. MAXIMUM WEEKLY--$98-858 FOR WIDOW, 1/5 OF STATES HIGHER FOR WIDOW WITH CHILDREN. OTHER ELIGIBLE SURVIVORS--DEPENDENT PARENTS, BROTHERS AND SISTERS.	PENSION (WORK INJURY)--40% OF EARNINGS IF 45 OR CARING FOR CHILD OTHERWISE 30% TO WIDOW OR DEPENDENT WIDOWER. ORPHANS--20% FOR EACH UNDER 18 (25 IS STUDENT OR INVALID), 30% IS FULL ORPHAN. PARENTS/GRANDPARENTS (IF NEEDY)--20% FOR 1, 30% FOR COUPLE. FUNERAL GRANTS--LUMP SUM OF $400-3,000 ACCORDING TO STATE. MAXIMUM-80% OF EARNINGS. DEATH GRANT--LUMP SUM OF 1 MONTHS EARNINGS, MINIMUM DM 400.

TABLE 2-25

UNEMPLOYMENT SOCIAL SECURITY
(1981)

	JAPAN 1ST LAW—1947 CURRENT—1975 COMPULSORY	U.S. 1ST LAW—1935 COMPULSORY	F. R. GERMANY, 1ST LAW—1927 CURRENT—1969 COMPULSORY
COVERAGE:	EMPLOYEES IN INDUSTRY AND COMMERCE (5 OR MORE/COMPANY). EXCLUSIONS—SEASONAL WORKERS, PUBLIC EMPLOYEES COVERED BY OTHER PROGRAMS. VOLUNTARY OR SPECIAL PROGRAMS FOR OTHERS.	FEDERAL LAW—EMPLOYEES OF FIRMS IN INDUSTRY AND COMMERCE; MOST STATE AND LOCAL GOVERNMENT WORKERS, DOMESTICS AND 2/5 OF FARM WORKERS. STATE PROGRAMS—EMPLOYEES COVERED BY FEDERAL LAW. EXCLUSIONS—AGRICULTURE, RELIGIOUS ORGANIZATIONS, CASUAL EMPLOYEES, FAMILY LABOR AND SELF-EMPLOYED. SPECIAL—FEDERAL PROGRAMS FOR RAILROAD AND FEDERAL EMPLOYEES, AND EX-SERVICEMEN.	EMPLOYED PERSONS EXCLUSIONS—CASUAL AND FAMILY LABOR.
SOURCE OF FUNDS:	INSURED—0.55% OF EARNINGS.	INSURED—NONE (EXCEPT AL, AK, NJ). GOVERNMENT—FEDERAL GOVERNMENTS PAYS FOR STATE ADMINISTRATION FROM FEDERAL TAX. MAXIMUM—$6000/YEAR UNDER FEDERAL TAX AND 40 STATE PROGRAMS, SOME STATES PAY HIGHER.	INSURED—1.5% OF EARNINGS. EMPLOYER—1/5% OF PAYROLL. GOVERNMENT—SUBSIDIES, COST OF INSURANCE CONTRIBUTION FOR UNEMPLOYED.
QUALIFIERS:	BENEFIT—6 MONTHS OF INSURANCE IN LAST YEAR REGISTERED, CAPABLE OF WORK AND REPORTING EVERY 4 WEEKS. NOT DUE TO VOLUNTARY LEAVING, JOB REFUSAL, TRAINING NON-ATTENDANCE.	BENEFITS—3/4 STATES REQUIRE MINIMUM EARNINGS IN PRECEDING YEAR, OTHERS SPECIFIC NUMBER OF WEEKS REGISTERED AND ABLE TO WORK. UNEMPLOYED—NOT DUE TO VOLUNTARY LEAVING, MISCONDUCT, LABOR DISPUTE, REFUSAL OF SUITABLE OFFER.	BENEFITS—180 DAYS OF INSURED EMPLOYMENT IN LAST 3 YEARS. REGISTERED, CAPABLE AND AVAILABLE FOR WORK, WORKING LESS THAN 20 HOURS/WEEK. UNEMPLOYMENT NOT DUE TO VOLUNTARY LEAVING, MISCONDUCT, PARTICIPATION IN STRIKE, JOB REFUSAL, TRAINING. SPECIAL PAYMENTS FOR REDUCED LABOR HOURS.
CASH BENEFITS:	BENEFIT—60-80% OF EARNINGS. MINIMUM—2,140 YEN/DAY MAXIMUM—6,670 YEN/DAY ADDITIONAL—SICKNESS AND INJURY, SKILL AQUISITION, BOARDING, EQUIPMENT AND MOVING EXPENSE. PAYABLE—AFTER 7 DAYS WAIT FOR 90-330 DAYS IN 1 YEAR ACCORDING TO LENGTH OF INSURANCE, AGE GROUP, EMPLOYMENT PROSPECTS.	BENEFITS—50% EARNINGS BY STATE—FORMULA: MINIMUM—$15-$43/WEEK MAXIMUM—$84-196/WEEK DEPENDENTS' SUPPLEMENT—1/4 OF STATES, $1.65/WEEK/CHILD, OTHER SOMETIMES INCLUDED. PAYABLE - 1 WEEK WAIT, FOR UP TO 26-39 WEEKS. ASSISTANCE—AVAILABLE TO SOME INELIGIBLE WORKERS NOT COVERED, NEEDY, EXHAUSTED BENEFITS.	BENEFIT—69-41% EARNINGS ON WAGE LEVEL, DEPENDENT SUPPLEMENTS. PAYABLE—FIRST DAY FOR 13-52 WEEKS BY DURATION OF INSURED'S EMPLOYMENT. ASSISTANCE (MEAN TESTED) 60-35% OF EARNINGS IF INELIGIBLE FOR REGULAR AND AND EXHAUSTION OF BENEFITS ANNUAL QUALIFYING EXAM, NO DURATION LIMIT. MAINTENANCE ALLOWANCES—TRAINING AND REHABILITATION.

- It encourages collection of benefits rather than the return to gainful employment whether in the previous or new employment categories.

- The elimination of a substandard level of existence is not a social or national concern.

Conclusion

In general, the U.S. Social Security System, with its increasing demands and decreasing funds and surplus, is nearing bankruptcy, which will leave millions below poverty level. A complete review and revision, if not a total replacement, of the current system is needed before its surplus is totally exhausted. There is a pressing need to upgrade the income level of its recipients, encourage training, retraining and employment, and provide the possibility of employment. Just as Japan adopted an American idea of industrialization, the U.S. might profit from an examination of Japan's unemployment and work injury compensation programs. Old age and invalidity guidelines need to be reviewed and brought up to current economic levels; even with employee retirement plans and the increasing economic levels of Americans, millions do not qualify for retirement benefits. Finally, the "baby boom" generation, when it reaches retirement age, will put additional burdens on an already strained system.

C.3 PURSUIT OF HAPPINESS

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C.3 PURSUIT OF HAPPINESS

C.3.1 INTRODUCTION

In recent years, quantitative values have been assigned to the previously "intangible" aspirations related to "pursuit of happiness." These assessments are based upon the assumptions that the general contentment of a society is related to the freedoms guaranteed its citizens, the opportunities supplied by the government to pursue those freedoms, and the perception of the citizen of his ability to enjoy an uninhibited search for social and self-enrichment. Numerous societies have maintained the ideals of freedom, individual dignity and social equality, while subordinating the objectives of wealth, health and security. The U.S. has historically exerted a leading role in the pursuit of these "ideals."

The aspirations for happiness can be resolved into two upper level categories; social-fulfillment and self-fulfillment. Social-fulfillment depends upon a society's constitutional guarantees such as those maintained in the U.S. Constitution with its amendments and Bill of Rights, and upon how well these constitutional promises are maintained in the actual workings of the society. The key factors of social-fulfillment are the citizenry's degree of political rights, civil liberty, sectoral equality, and the control which the individual maintains over his personal life. Self-fulfillment may be defined as an individual's ability to achieve personal and cultural aspirations in addition to those necessary for a basic participation in society. Self-fulfillment, is also related to the constitutional guarantees provided by the society, and the individual's perception and use of the opportunities available to him.

Figure 3-1 illustrates the breakdown of the pursuit of happiness into social and self-fulfillment aspirations.

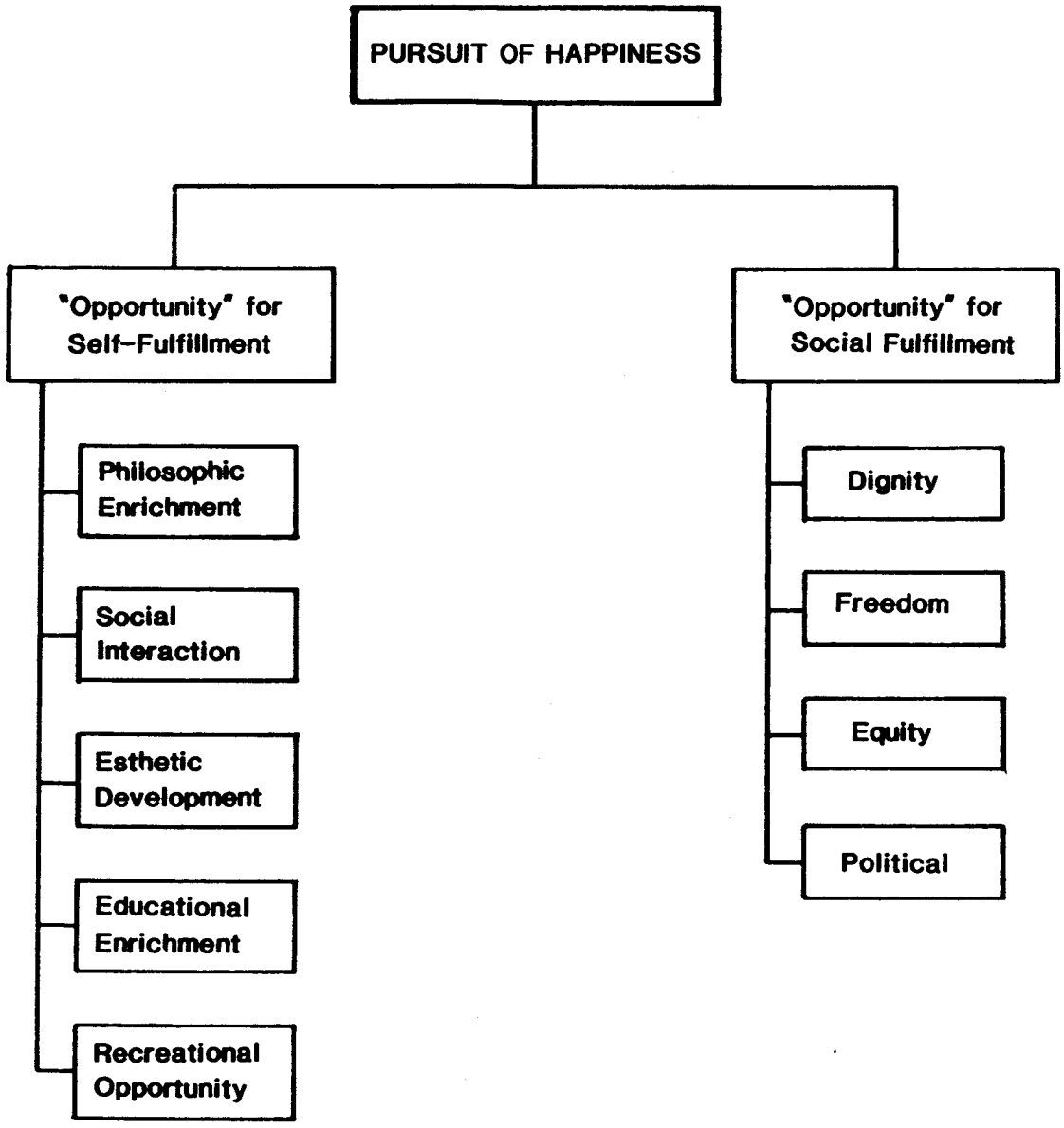


Figure 3-1. Top-Down Aspirations for Pursuit of Happiness

C.3.2 SOCIAL-FULFILLMENT

The ability of a populous to freely express itself verbally, economically and socially indicates its capacity for social-fulfillment. The specific measures of social-fulfillment for an individual or group are:

- Political rights,
- Civil liberty, and
- Sectoral equality.

These rights are controlled and granted by the national constitution, state government, or ruling faction. Accordingly, they influence an individual's movements, employment, life style, education, standard-of-living and societal standing. The less restricted the society, the more social-fulfillment is possible; the easement of one factor can lead to the fulfillment of the others.

Political Rights

Basic political rights are freedoms of speech, suffrage, and religion. The principal quantitative criteria for assessing these political rights are the degree of freedom with which citizens may form political assemblages, participate in general electoral processes, and compete for public offices. The Political Rights Index, Table 3-1, measures the citizen's capacity to determine who will govern a country and the nature of its laws.

A significant measure of these political rights is the distribution of civil and political unrest and reaction, shown in Figure 3-2 and Table 3-2, in which protest events and events by target and issue are compared among various countries. Unrest in this sense represents the ability of a populous, as guaranteed by its degree of political freedom, to speak out against a particular governmental policy. The U.S., with its strong political and

TABLE 3-1

GASTIL'S POLITICAL RIGHTS INDEX FOR 1979

COUNTRY	RANKING
U.S.	1
U.K.	1
SWEDEN	1
FRANCE	1
F.R. GERMANY	1
ITALY	2
JAPAN	2
INDIA	2
MEXICO	4
SAUDI ARABIA	6
U.S.S.R.	7

1 = HIGHEST POLITICAL RIGHTS

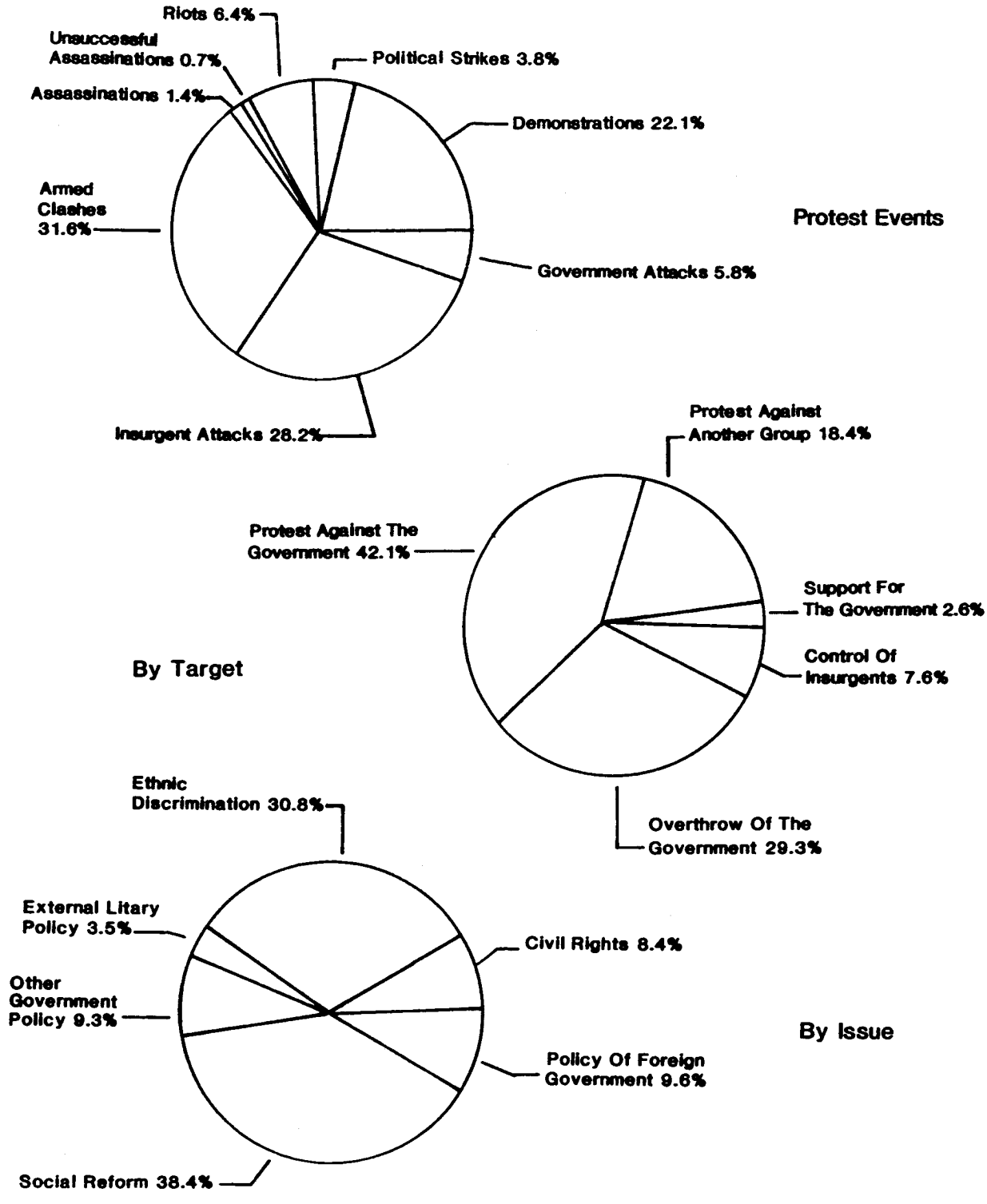
7 = LEAST POLITICAL RIGHTS

civil rights guarantees, clearly shows a higher unrest level than the U.S.S.R., where the state organizes the majority of protests against other countries, e.g., the NATO missile installations.

Civil Liberty

Civil liberty, the nonpolitical rights of a citizen, is freedom from arbitrary governmental interference. The U.S. provides civil liberties of speech, vote, religious practice and participation to U.S. citizens through the Constitution and the Bill of Rights.

The Civil Rights Index, Table 3-3, is the balance between the political rights of majorities vis-a-vis the civil liberties of minorities, i.e., the rights of the individual vis-a-vis the state. The principal criterion for assessing civil rights is the degree of freedom of individual expression in a society, as evidenced particularly by the news media coverage of current events.



Source: World Handbook of Political and Social Indicators, Volume II, 1983

Figure 3-2. Distribution of Protest Events

TABLE 3-2

SOCIAL AND POLITICAL UNREST:
DOMESTIC POLITICAL CONFLICTS
(1948-1977)

	PROTEST DEMONSTRATIONS	STRIKES	POLITICAL RIOTS	DEATH FROM ASSASSINATIONS	POLITICAL VIOLENCE	EXECUTIONS
U.S.	2,184	154	861	5	434	2
U.K.	691	142	372	50	1,463	1
U.S.S.R.	411	1	70	1	411	124
FRANCE	378	154	207	4	164	4
F.R. GERMANY	300	22	143	4	61	N/A
INDIA	290	1,341	678	30	7,590	2
ITALY	230	173	444	6	259	N/A
JAPAN	225	37	195	2	60	N/A
MEXICO	55	48	177	11	781	N/A
SAUDI ARABIA	N/A	1	N/A	1	1	50

SOURCE: WORLD HANDBOOK OF POLITICAL AND SOCIAL INDICATORS, VOLUME II, 1983

TABLE 3-3

GASTIL'S CIVIL RIGHTS INDEX FOR 1979

COUNTRY	RANKING
U.S.	1
U.K.	1
SWEDEN	1
JAPAN	1
FRANCE	2
F.R. GERMANY	2
INDIA	2
ITALY	2
MEXICO	4
SAUDI ARABIA	6
U.S.S.R.	6

1 = HIGHEST CIVIL LIBERTY
7 = LEAST CIVIL LIBERTY

Civil rights are also shown, among other ways, such as the ability to change government representation in a regularly scheduled election when the government is not acceptable or appropriate for the majority. In some countries, e.g., the U.S., there are scheduled elections that provide for the election or re-election of the president, senators, representatives, governors, and other elected officials. In other countries, for e.g., the U.K., an election is called by the government in power or to form a power base when needed. In still others, like the U.S.S.R., shifts in governmental personnel occur when a death forces supporting officials to assume power, with the population confirming the change after the event. Some countries change by coup d'etat without confirmation by the people, although in some instances the citizenry may confirm or replace the new government.

The government elections and changes in Table 3-4 give an indication of how much influence the "vote" has in executive changes and adjustments, the percentage of voter turnout and the world rank for two election periods.

The right to practice religion openly plays an important role in social-fulfillment. The Spanish Inquisition is a blatant example of the denial of this civil right. Today, the repression of religion or the total ban of religious practices is less evident in developed countries, but still exists. The political control of any belief, including religious, is a denial of a civil right as is the segregation by class or ethnic group. By 1981, there were 339,000 churches and temples, with total membership of 138.5 million people among over 87 religious bodies in the U.S. This signifies a high level of freedom to worship, choose and form religious congregations and assemblies.

Sectoral Equality

Sectoral equality measures the evenness in development, income earning behavior, and distribution of a society's total resource allocation. It includes the distribution of food, medical resources and housing to all areas and income groups, among rural and urban populations, and minority and majority ethnic groups.

The GINI coefficient of Sectoral Inequality (Table 3-5) measures the distribution of wealth across all economic classes of a society. A GINI coefficient of 100 indicates that one individual controls the wealth of the entire society; a coefficient of 0 indicates that the society's income is distributed equally among all its members.

The distribution of wealth and services to the populous is indicative of the sectoral constitution of the country, its agricultural and manufacturing capabilities, and its accessibility to communications and the media. These changes, along with increased literacy levels and increases in social freedoms, show the increase of equality. The possession of "luxuries" and the availability of the leisure time to utilize them is covered in Section C.3.3.

TABLE 3-4

MEASUREMENTS AND INDICATIONS OF VOTER INFLUENCE IN POLITICAL CHANGES

GOVERNMENT ELECTIONS AND CHANGES FROM 1948-1977

	NATIONAL ELECTIONS	EXECUTIVE[a] ADJUSTMENT	REGULAR[b] EXECUTIVE CHANGES
U.S.	15	69	6
U.K.	11	98	9
U.S.S.R.	7	245	11
FRANCE	26	61	29
F.R. GERMANY	10	50	20
INDIA	13	105	12
ITALY	11	28	27
JAPAN	21	59	17
MEXICO	10	18	5
SAUDI ARABIA	N/A	42	5

VOTER TURNOUT AS PERCENT OF ADULT POPULATION

	RANK	FIRST PERIOD	YEAR	SECOND PERIOD	YEAR
U.S.	73	56.8	1964	54.0	1976
U.K.	48	72.4	1966	75.4	1974
U.S.S.R.	13	97.7	1966	98.4	1974
FRANCE	60	66.5	1967	66.2	1973
F.R.GERMANY	30	77.6	1965	87.2	1977
INDIA	58	55.8	1967	66.6	1977
ITALY	15	81.0	1966	95.7	1977
JAPAN	49	72.3	1967	75.3	1977
MEXICO	65	—	—	62.3	1974
SWEDEN	23	78.1	1964	90.8	1977

[a] CHANGE IN TOP LEADERSHIP NOT SIGNIFYING A TRANSFER OF POWER, i.e., CABINETS, MINISTERS, COUNCILS.

[b] LEGAL OR CUSTOMARY PROCEDURES USED TO CHANGE THE OFFICE OF NATIONAL CHIEF EXECUTIVE, WITH NO VIOLENCE THREATENED, INCLUDES MONARCHS, PRESIDENTS, PRIME MINISTERS, PARTY CHIEFS.

SOURCE: WORLD HANDBOOK OF POLITICAL AND SOCIAL INDUSTRIES, THIRD EDITION

TABLE 3-5

GINI COEFFICIENT SECTORAL INEQUALITY (X100)

COUNTRY	1960	1970
U.S.	3.1	1.7
U.K.	1.3	2.3
F.R. GERMANY	9.7	8.2
SWEDEN	14.7	9.7
FRANCE	15.3	12.7
ITALY	23.1	15.3
JAPAN	23.1	16.9
INDIA	23.4	20.5
MEXICO	42.8	36.2
SAUDI ARABIA	--	70.8

Table 3-6 shows the distribution of wealth among several countries in terms of GDP per capita, energy consumption, income distribution and dwellings with piped water. Some countries do not have such information available or have chosen not to release it.

Education, above mandatory levels, is another measure of social-fulfillment and the ability to further the individual's standing in a society. Table 3-7 shows the illiteracy level and enrollment in higher education rates of selected countries. Urbanization is also shown since it represents the ability of a population to reside in areas where access to employment, more opportunity for enrichment and higher education are available.

Social equality, in addition to producing wealth, education and access to better standards of living, also facilitates communications with family, friends, and the rest of the world. Table 3-8 shows the availability of communications systems among comparative countries.

TABLE 3-6

MEASUREMENTS OF WEALTH DISTRIBUTION
AMONG SEVERAL COUNTRIES

DISTRIBUTION OF WEALTH

	GDP PER CAPITA (1978 U.S. $)	ENERGY CONSUMPTION (1980 U.S. $)	ENERGY CONSUMPTION (1981 COAL EQUIPMENT kg)
U.S.	9,770	10,408	10,204
U.K.	5,720	7,210	4,641
U.S.S.R.	3,710	4,861	5,738
SWEDEN	10,540	13,032	5,156
FRANCE	8,880	10,709	4,081
ITALY	4,600	5,855	3,273
INDIA	180	208	199
JAPAN	7,700	8,946	3,575
SAUDI ARABIA	6,590	N/A	1,680
MEXICO	1,400	1,901	1,687
F.R. GERMANY	10,300	12,485	5,614

DISTRIBUTION OF INCOME TO GIVEN PERCENT OF POPULATION

	TOP 20%	BOTTOM 40%	YEAR
U.S.	42.8	15.2	1972
U.K.	38.8	18.9	1963
U.S.S.R.	N/A	N/A	N/A
SWEDEN	37.0	19.7	1972
FRANCE	46.9	14.1	1970
ITALY	46.5	15.6	1969
INDIA	48.9	17.2	1965
JAPAN	41.0	21.0	1969
SAUDI ARABIA	N/A	N/A	N/A
MEXICO	54.4	10.3	1977
F.R. GERMANY	46.2	16.8	1973

DWELLINGS WITH PIPED WATER

	AS PERCENT OF ALL DWELLINGS		
	TOTAL	URBAN	YEAR(S)
U.S.	97.5	99.7	1970
U.K.	N/A	N/A	N/A
U.S.S.R.	N/A	N/A	N/A
SWEDEN	98.7	99.7	1975
FRANCE	96.6	98.1	1973/75
ITALY	N/A	N/A	N/A
INDIA	N/A	N/A	N/A
JAPAN	98.3	99.3	1973
SAUDI ARABIA	N/A	N/A	N/A
MEXICO	38.7	54.0	1970
F.R. GERMANY	N/A	N/A	N/A

SOURCES: WORLD HANDBOOK OF POLITICAL AND SOCIAL INDICATORS, 3RD EDITION.

TABLE 3-7

EDUCATION MEASUREMENTS OF SOCIAL-FULFILLMENT

COUNTRY	ILLITERACY PERCENT OF POPULATION OVER 14 (1980)	ENROLLMENT IN HIGHER EDUCATION POPULATION (1975)	URBANIZATION (CITIES>100,000) PERCENTAGE	DATE
U.S.	0.5	52.3	72	1975
U.K.	0.5	12.5	63	1976
U.S.S.R.	0.5	19.0	36	1977
SWEDEN	0.5	19.6	28	1976
FRANCE	0.5	19.6	45	1968
ITALY	5.2	17.8	29	1976
INDIA	59.7	5.6	10	1971
JAPAN	0.5	20.2	58	1976
SAUDI ARABIA	83.8	2.9	26	1974
MEXICO	16.1	8.8	33	1976
F.R. GERMANY	0.5	13.6	35	1976

SOURCES: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984
WORLD HANDBOOK OF POLITICAL AND SOCIAL INDICATORS, 3RD EDITION

TABLE 3-8

AVAILABILITY OF COMMUNICATIONS SYSTEMS

COUNTRY	TELEPHONES PER 100 PERSONS (1980)	DAILY NEWSPAPERS NUMBER (1979)	DAILY NEWSPAPERS CIRCULATION COPIES PER 1000 PERSONS (1980)	TELEVISION PER 1000 PERSONS (1980)	RADIOS PER 1000 PERSONS (1980)
U.S.	78.8	1,787	282	624	2,099
U.K.	47.7	120	N/A	404	947
U.S.S.R.	8.9[d]	686[a]	396[a]	303[c]	490
SWEDEN	79.6	112	526	381[b]	383[b,c]
FRANCE	45.9	96[a]	205[a]	354	895
F.R. GERMANY	46.6	412[a]	423[a]	337[b]	370[b]
JAPAN	46.0	178	569	539	678
MEXICO	7.2	352[a]	N/A	104	285
INDIA	0.4[a]	1,087	20	2[b]	45[b]
ITALY	33.7	1,087	93	386	242[b]
SAUDI ARABIA	5.3	12	N/A	251	299

[a] 1979
[b] NUMBERS OF LICENSES ISSUED
[c] 1975
[d] EXCLUDING TELEPHONE SYSTEM OF MILITARY FORCES

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

C.3.3 SELF-FULFILLMENT

Self-fulfillment, the personal measure of satisfaction and the ability to obtain personal goals, has long been a goal of society. Historically, self-fulfillment has been frequently curtailed through the withholding of political, religious, and economic freedoms. The U.S., founded on these freedoms, enhances the prospect of achieving self-fulfillment. For this reason, the U.S. attracts over 500,000 legal immigrants a year from countries where individual self-fulfillment is not attainable.

The capability to fulfill goals and desires has been considerably improved in modern societies. Technology has provided time savings devices, such as home appliances, to produce a final product more quickly, efficiently, and with little supervision; and communications devices to speed business and personal messages, purchases and correspondences. Labor laws have increased the time allotted to pursue ones desires, by initiating vacations and holidays, the 4-day work week and flextime. Public and private transportation provide access to the work place in a convenient, speedy manner, and permit access to vacation, recreation and leisure locations.

These modern factors provide the U.S. population with something unheard of in previous centuries and in the early part of this century--"leisure time." The utilization of leisure time can take various forms, such as:

- Recreational opportunity,
- Educational enrichment,
- Esthetic development,
- Social interaction, and
- Philosophic enrichment.

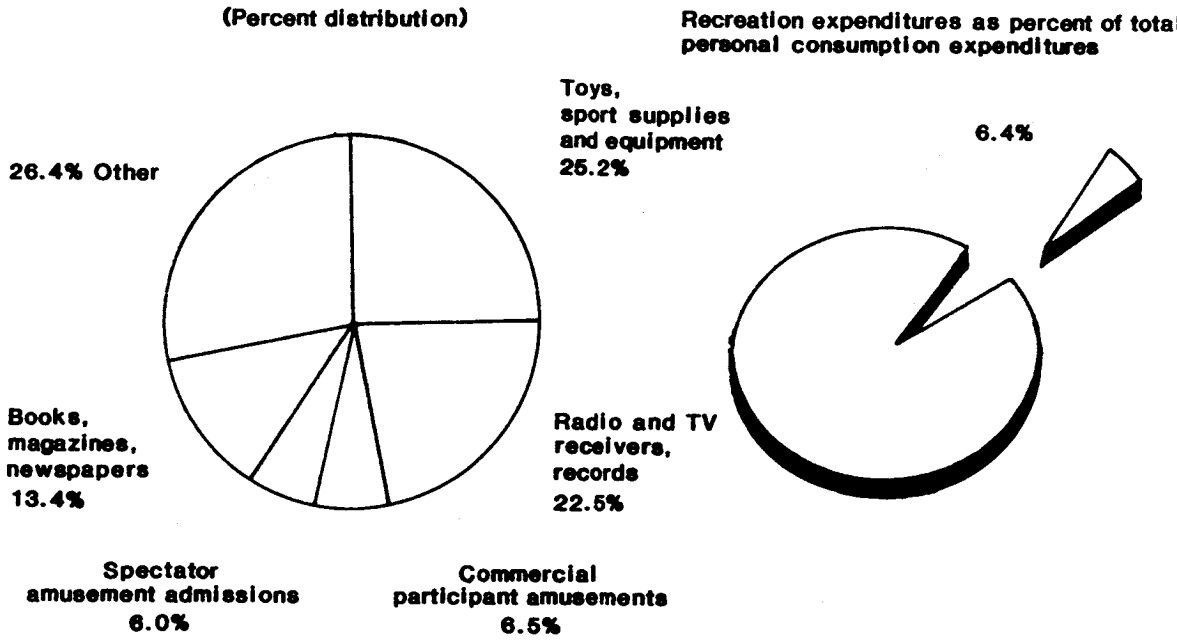
Trends and "fads" create surges of participation in a particular leisure time activity that could last months or years. As

these "fads" decrease in popularity, a percentage of the population still retains interest in them even after the next cycle or trend emerges. Certain activities, generally fitness-related like tennis, remain more constant, although the number of participants fluctuates.

Recreation comprises the major portion of leisure time activity. Although many forms of recreation require physical or mental exertion, the orientation away from "work" is refreshing and restorative. These multifaceted activities include sports, travel, vacations, relaxation, reading, learning, listening and watching. Many of these activities are combined with educational enrichment, social interaction and esthetic development. For example, a book, a trip to a museum or a vacation can serve to relax the person and enrich the mind by combining a sense of history, geography, cultural differences and technical knowledge.

Figure 3-3 and Table 3-9 break down personal consumption expenditures for recreation into percentages and dollars. These financial expenditures for recreation have maintained a constant 6.6% average over the recorded 12-year period. Close examination of total and per capita outlays shows higher increases in cultural-type goods and services than for leisure/recreational outlays. This does not indicate whether the leisure expenditures are diminishing because of decreased activity, nonreplacement of existing equipment, increasing nonequipment recreation or multi-recreation.

Americans spend the major portion of their leisure time with activities and projects at home. After the initial expenditures for a television set, and a radio and stereo system, the majority of household activities do not require great financial expenditures. These activities include reading papers, periodicals, and books borrowed from the public library system. In 1978, an estimated 8.5 million people visited public libraries each week, completing 3.8 million transactions (Ref. 1).



Source: U.S. Bureau of the Census

Figure 3-3. Personal Consumption Expenditures for Recreation: 1982

TABLE 3-9

PERSONAL CONSUMPTION EXPENDITURES
FOR RECREATION: 1970 TO 1982
(MILLIONS OF $)

TYPE OF PRODUCT OR SERVICE	1970	1975	1980	1981	1982
BOOKS & MAPS	2,903	3,775	6,562	7,316	7,767
MAGAZINES, NEWSPAPERS, SHEET MUSIC	4,005	5,640	8,581	9,108	9,279
NONDURABLE TOYS & SPORT SUPPLIES	5,474	8,523	13,795	15,188	15,620
RADIO & TV RECEIVER, RECORDS, MUSICAL INSTRUMENTS	8,436	13,970	22,221	24,359	24,604
RADIO & TELEVISION REPAIR	1,279	2,246	3,343	3,676	3,923
FLOWERS, SEEDS, & POTTED PLANTS	1,775	2,965	4,871	5,406	4,995
ADMISSIONS TO SPECTATOR AMUSEMENTS	3,210	3,591	6,438	6,919	7,642
● MOTION PICTURE THEATERS	1,536	1,480	2,750	2,966	3,450
● LEGITIMATE THEATERS AND OPERA AND ENTERTAINMENTS OF NONPROFIT INSTITUTIONS[a]	501	667	1,431	1,641	1,717
● SPECTATOR SPORTS	1,173	1,444	2,257	2,312	2,475
CLUBS & FRATERNAL ORGANIZATIONS[b]	1,216	1,654	2,278	2,521	2,751
COMMERCIAL PARTICIPANT AMUSEMENTS[c]	2,189	3,615	6,076	7,490	8,296
PANMUTUAL NET RECEIPTS	1,906	1,568	1,859	2,184	2,313
OTHER[d]	4,593	8,273	15,762	20,150	23,147
TOTAL RECREATION EXPENDITURES	**40,196**	**59,411**	**98,224**	**111,236**	**117,979**
PERCENT OF TOTAL PERSONAL CONSUMPTION	6.6	6.7	6.4	6.5	6.4

[a] EXCEPT ATHLETIC

[b] CONSISTS OF DUES AND FEES EXCLUDING INSURANCE PREMIUMS

[c] CONSISTS OF BILLIARD PARLORS, BOWLING ALLEYS; DANCING, RIDING, SHOOTING, SKATING, AND SWIMMING PLACES, AMUSEMENT DEVICES AND PARKS, GOLF COURSES, SIGHTSEEING BUSES AND GUIDES, PRIVATE FLYING OPERATIONS AND OTHER COMMERICAL PARTICIPANT AMUSEMENTS

[d] CONSISTS OF NET RECEIPTS OF LOTTERIES AND EXPENDITURES FOR PURCHASE OF PETS AND PET CARE SERVICES, CABLE TV, FILM PROCESSING, PHOTOGRAPHIC STUDIOS, SPORTING AND RECREATION CAMPS, AND RECREATIONAL SERVICES, NOT ELSEWHERE CLASSIFIED.

SOURCE: U.S. DOC/BEA: THE NATIONAL INCOME AND PRODUCT ACCOUNTS OF THE UNITED STATES, 1929-1976; SURVEY OF CURRENT BUSINESS, JULY 1982 AND JULY 1983

A sample survey of the primary household activities and percentages of leisure time participation in these activities is presented in Table 3-10. Expenditures for these primary leisure activities, listed in Table 3-11, do not distinguish between books and newsprint used for business, education or leisure, or account for the duplicity of these items.

Current estimates for the video home market, the newest home entertainment idea, are that over 8 million video machines will be in the home by 1985, a 7.2 million increase over 1980 (Ref. 2). Presently 14,000 rental agencies supply the homeowner with tapes and disks (Ref. 3). In the future, this addition to TV and stereo is expected to supply cultural and educational viewing.

Americans are fascinated with watching others participate in sporting events. In recent years, women have been watching and participating in sporting events at an increasing rate. More leisure time, increased understanding, and the national trend toward physical and "self" development are slowly making the term "sports widow" extinct. Spectator and amateur sports, as shown in Table 3-12, provide commonality in interest and discussion at home, the office and social occasions, as well as enjoyment and self gain. Sports allow a person to participate on a personal level by watching and/or playing while making and enhancing friendships. These events lead to other social interactions such as pregame gatherings, halftime and tail-gate parties, and post-game gatherings.

Activities that used to be the mainstay of survival in the early history of our country are retaining their importance as recreational activities. For example, hunting and fishing are still significant recreations among the U.S. population. These sports activities, listed on Table 3-13, provide a duel purpose for many of their participants--pleasure and food--and are therefore largely oriented toward individual participation.

TABLE 3-10

PARTICIPATION IN LEISURE TIME ACTIVITIES
BY SELECTED TYPE, 1983

TYPE OF ACTIVITY	NUMBER (MILLION)	PERCENT[a]
WATCHING TELEVISION	68	81
LISTENING TO MUSIC	54	64
PLEASURE TRIPS IN CARS	37	44
GOING TO THE MOVIES	36	42
VEGETABLE GARDENING	35	42
VACATION TRIPS IN U.S.	29	34
SEWING/NEEDLEPOINT	27	32
WATCHING PROFESSIONAL SPORTS (TV)	33	39
GENERAL EXERCISE/PHYSICAL FITNESS	26	31
FISHING	26	31
CAMPING	17	20
BICYCLING	19	22
TENNIS	10	12
WORKSHOP/HOME REPAIR	25	29
JOGGING	16	19
BOWLING	17	20
HUNTING	14	16
PHOTOGRAPHY	17	20
HIKING	12	14
GOLF	10	12
SWIMMING IN OWN POOL	7	8
HORSEBACK RIDING	8	9
RACQUETBALL	6	7
BOATING (POWER)	8	10
SKIING (DOWNHILL)	5	6
VACATION TRIPS OUTSIDE U.S.	5	6
SNOWMOBILING	3	4
CROSS-COUNTRY SKIING	3	4
ARCHERY	3	4

[a] PERCENT OF ALL HOUSEHOLDS

SOURCES: GARDENS FOR ALL, THE NATIONAL ASSOCIATION FOR GARDENING, BURLINGTON, VT
NATIONAL GARDENING SURVEY, UNPUBLISHED DATA
GALLUP ORGANIZATION, INC.

TABLE 3-11

LEISURE TIME STATISTICS

	1975	1980	1981	1982
BOOKS (MILLION)				
QUANTITY SOLD	1,405	1,693	1,735	---
NEW BOOK PUBLICATIONS	39,372	42,377	48,793	46,935
NEWSPAPERS				
NUMBER	11,400	9,620	9,676	9,183
DAILY CIRCULATION (MILLION)	60.7	62.2	61.4	62.5
PERIODICALS				
NUMBER	9,657	10,236	10,873	10,688
PHONOGRAPH RECORD SHIPMENTS (MILLION)				
DOMESTIC	421	487	450	379
VALUE (MILLION $)	1,696	2,560	2,598	2,177
IMPORTED (MILLION)	9	18	23	24
VALUE (MILLION $)	12	34	49	51
PRERECORDED TAPES				
DOMESTIC (MILLION)	112	197	186	197
VALUE (MILLION $)	695	1,303	1,372	1,415
IMPORTED (MILLION)	7	20	20	36
VALUE (MILLION $)	3	13	11	23
VIDEO GAMES (MILLION $)				
COIN OPERATED	---	0.6	1.0	1.2
HOUSEHOLD CONSOLES	---	3.6	7.5	14.1
INDUSTRY SHIPMENTS OF SOFTWARE & VIDEO GAMES	---	11.8	42.5	100.9
INDUSTRY REVENUES SOFTWARE & VIDEO GAMES	---	810.6	2,260.8	3,668.5
RADIO (MILLION)				
SETS	34.5	39.6	44.4	44.1
PUBLIC STATIONS	169	217	238	255
TELEVISION (MILLION)				
SETS	10.6	18.5	18.5	16.4
PUBLIC STATIONS	260	290	293	299
CABLE TELEVISION				
COMMUNITIES (NUMBER)	7,198[a]	8,678	11,944	N/A
SYSTEMS	3.5	4.2	4.4	4.8
SUBSCRIBERS	9.8	16.0	18.3	21.0

[a] 1976

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

TABLE 3-12

STATISTICS ON SPECTATOR AND AMATEUR SPORTS[a]

SPECTATOR SPORTS	1970	1975	1980	1981	1982
BASEBALL					
MAJOR LEAGUE TEAMS	26	26	28	28	28
MAJOR LEAGUE ATTENDANCE (MILLIONS)	29.2	30.4	43.7	27.3	45.4
BASKETBALL					
COLLEGE TEAMS (THOUSANDS)	N/A	N/A	1.3	1.3	1.3
COLLEGE TEAM ATTENDANCE (MILLIONS)	N/A	N/A	30.7	30.9	31.1
PROFESSIONAL TEAMS	N/A	N/A	23	23	23
PROFESSIONAL ATTENDANCE (MILLIONS)	7.1	11.0	10.7	10.2	10.8
FOOTBALL					
COLLEGE TEAMS	617	634	642	648	649
COLLEGE TEAM ATTENDANCE (MILLION)	29.5	31.7	35.5	35.8	36.6
PROFESSIONAL	26	26	28	28	28
PROFESSIONAL ATTENDANCE (MILLION)	10.1	10.8	14.1	14.3	8.5[b]
N.A. SOCCER LEAGUE					
TEAMS	6	20	24	21	14
ATTENDANCE (MILLIONS)[c]	N/A	1.8	6.2	5.4	3.2
HOCKEY LEAGUES					
TEAMS	N/A	N/A	21	21	21
ATTENDANCE (MILLIONS)	6.0	13.6	10.5	10.7	10.7
HORSERACING					
NUMBER OF RACING DAYS (THOUSANDS)	10.0	13.1	13.1	13.5	13.5
ATTENDANCE (MILLIONS)	61.7	78.7	74.7	75.5	76.9
GREYHOUND					
NUMBER OF RACING DAYS (THOUSANDS)	3.0	4.0	5.9	6.4	6.5
ATTENDANCE (MILLIONS)	12.7	17.5	20.9	21.4	21.4
AMATEUR SPORTS	**1970**	**1975**	**1980**	**1981**	**1982**
AMATEUR SOFTBALL					
PARTICIPANTS (MILLIONS)	16	26	30	30	30
TEAMS (THOUSANDS)	31	75	128	137	155
GOLF					
GOLFERS (MILLIONS)	9.7	12	13	13.7	14.1
NUMBER OF COURSES	10,188	12,306	12,849	12,894	13,013
TENNIS					
PLAYERS (MILLIONS)	10.66	33.27	N/A	N/A	29.47
COURTS (MILLIONS)	0.10	0.14	0.19	0.19	0.21
TENPIN BOWLING					
NUMBER OF ESTABLISHMENTS (MILLIONS)	9.14	8.59	8.60	8.53	8.48
LANES (BILLIONS)	0.14	0.14	0.15	0.15	0.15
MEMBERSHIP (MILLIONS)	7.73	8.75	9.60	9.62	9.60
BICYCLES SHIPMENTS					
DOMESTIC (MILLIONS)	5.0	5.6	7.0	6.8	5.2
IMPORTS (MILLIONS)	1.9	1.7	2.0	2.1	1.6
BOATING					
RECREATIONAL BOATS OWNED (MILLIONS)	8.8	9.7	11.8	12.5	12.9
EXPENDITURES (MILLION $)	3.4	4.8	7.4	8.3	8.1
SNOWMOBILES					
FACTORY SALES (MILLION $)	0.17	0.14	0.1	0.06	0.08

[a] DOES NOT INCLUDE PRESEASON OR PLAYOFFS
[b] STRIKE
[c] BOTH LEAGUES MERGED

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

TABLE 3-13
RECREATIONAL SPORTS

	1960	1965	1970	1975	1980
SPORTSMEN					
TOTAL (MILLIONS)	30.4	32.9	36.8	45.8	47.0
EXPENDITURES (MILLION $)	3,852	4,046	7,102	16,768	27,214
FISHERMEN					
TOTAL (MILLIONS)	25.3	28.3	33.2	41.3	41.9
EXPENDITURES (MILLION $)	2,691	2,925	4,959	11,798	18,052
● **FRESHWATER**					
NUMBER (MILLIONS)	21.7	24.0	29.4	36.6	37.1
EXPENDITURES (MILLION $)	2,065	2,126	3,734	8,702	14,441
● **SALTWATER**					
NUMBER (MILLIONS)	6.3	8.3	9.5	13.7	13.3
EXPENDITURES (MILLION $)	626	800	1,125	3,095	3,611
● **FISHING LICENSES**					
SALES (MISSION $)	23.3	25.0	31.1	34.7	35.2
HOLDERS (MILLIONS)	19.1	20.5	24.4	27.5	28.0
HUNTERS					
TOTAL (MILLIONS)	14.6	13.6	14.3	17.1	16.8
EXPENDITURES (MILLION $)	1,161	1,121	2,143	4,971	8,938
● **SMALL GAME**					
NUMBER (MILLIONS)	12.1	10.6	11.7	14.2	14.6
EXPENDITURES (MILLION $)	726	615	946	2,272	2,930
● **BIG GAME**					
NUMBER (MILLIONS)	6.3	6.6	7.8	11.0	12.6
EXPENDITURES (MILLION $)	346	419	953	2,128	5,246
● **WATERFOWL**					
NUMBER (MILLIONS)	2.0	1.7	2.9	4.3	3.2
EXPENDITURES (MILLION $)	89	87	244	570	761
● **HUNTING LICENSE**					
SALES (MILLION $)	18.4	19.4	22.2	25.9	196
HOLDERS (MILLIONS)	11.8	14.3	15.4	16.6	16.3
FEDERAL DUCK STAMPS SOLD (MILLIONS)	1.6	1.6	2.1	2.2	2.1

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

Other factors, such as increased free time and money have bolstered the amount of time spent on other forms of outdoor recreation. An estimated 73% of the population visits zoos, parks and carnivals at least once a year. In 1982, the federal government, through taxes, donations and other resources, provided 334 areas for people to visit for site seeing, camping, fishing and general recreation. These include parks, historical locales, trails, preserves and national museums. The National Air and Space Museum, the most popular site on the Mall in Washington, D.C., received over 10.6 million visitors from all over the world in 1983. Museums overall received 26.5 million visitors. Table 3-14 provides breakdowns of the National Park and nonprofit museum visitation statistics for camping, visiting and general recreation.

Coincident with this increased amount of free time, along with higher and multiple income conveniences, the American restaurant industry has been dramatically changed. The period between 1972 and 1982 witnessed a 49% increase in fast food facilities and a 9% increase in full menu restaurants. In 1981 food and beverages (Table 3-15) produced over $91 billion in sales overall. A comparison of this total with three other countries on Table 3-16 shows that expenditures for food use in the U.S. have been increasing at a lower rate, presumably as a result of the high number of fast food franchises available in the U.S.

Transportation improvements since the beginning of the century have broadened potential areas for travel and visitation. Table 3-17 depicts U.S. household travel characteristics. The recreational vehicles listed in Table 3-17 travel to the over 11,200 organized private camping sites and hundreds of federal and public camp sites across the U.S. Table 3-18 compares international tourist arrivals and receipts and methods of transportation for nine countries, including the U.S. These numbers include business as well as pleasure, but are a good indication of how highly we utilize our transportation facilities for day-to-day activities.

TABLE 3-14

NONRECREATIONAL VISITATION STATISTICS
(MILLIONS UNLESS NOTED DIFFERENTLY)

NATIONAL PARK SYSTEM	1960	1970	1980	1981	1982
VISITS (ALL AREAS)[a]	79.2	172.0	300.3	329.7	334.4
OVERNIGHTS[b]	9.4	16.2	16.5	17.0	16.9
EXPENDITURES ($)	74.2	138.8	574.3	1,172.9	1,012.5
REVENUE ($)	5.7	8.8	21.1	22.9	25.5
FUNDS AVAILABLE ($)	115.7	174.6	907.9	2,307.7	1,931.3
TOTAL ACREAGE	25.7	28.5	70.9	73.7	74.8
BUREAU OF LAND MANAGEMENT					
VISITS	N/A	188	407	334	317
ACREAGE	N/A	1014	0.05	0.04	0.03
ACRES	N/A	67.2	107.9	91.5	58.1
RECREATIONAL HOURS	N/A	366.2	588.1	498.7	317.0

NONPROFIT MUSEUMS (NUMBERS), 1979

MUSEUM TYPE	TOTAL	OPERATING INCOME ($)	OPERATING EXPENDITURES ($)
HISTORY	2,202	261	226
SCIENCE	800	380	368
ART	609	294	264
GENERAL	382	88	84
SPECIALIZED	197	27	27
PARK & VISITOR CENTERS	165	30	8
CHILDREN AND JUNIOR	51	8	8
TOTAL	4,406	1,088	985

[a] IN 1982, 334 AREAS
[b] PEAKED IN 1978 AT 17.6 MILLION PERSONS

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

TABLE 3-15

1981 FOOD AND BEVERAGE SALES

PLACES	**NUMBERS**	**SALES (MILLION $)**	**FRANCHISES**
EATING PLACES	244,345	74,675	16,200
BARS AND TAVERNS	38,879	8,321	N/A
HOTELS AND MOTELS	29,917	7,133	6,400
CLUBS	10,310	1,164	N/A
TOTAL	**323,451**	**$91,293**	**22,600**

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

TABLE 3-16

COMPARISON OF PRIVATE EXPENDITURES FOR RECREATION (MILLIONS U.S. $)

COUNTRY	1965	1970	1975	1980
U.S.				
ENTERTAINMENT, EDUCATION & CULTURE	32,476	52,927	83,335	136,076
OTHER RECREATION	25,744	40,622	63,272	102,779
RESTAURANTS, CAFES & HOTELS	24,127	35,227	56,929	97,778
FRANCE				
ENTERTAINMENT, EDUCATION & CULTURE	---	5,213	13,688	27,251
OTHER RECREATION	---	4,961	13,015	26,009
RESTAURANTS, CAFES & HOTELS	---	5,841	13,671	28,417
U.S. $ = 1 FRANC	$0.20	$0.18	$0.23	$0.24
F.R. GERMANY				
ENTERTAINMENT, EDUCATION & CULTURE	4,510	7,371	18,626	35,561
OTHER RECREATION	---	---	---	---
RESTAURANTS, CAFES & HOTELS	---	---	---	---
U.S. $ = 1 DM	$0.25	0.27	0.41	0.55
ITALY				
ENTERTAINMENT, EDUCATION & CULTURE	3,141	4,818	8,952	18,412
OTHER RECREATION	2,936	4,509	8,478	17,516
RESTAURANTS, CAFES & HOTELS	2,507	4,333	9,154	19,079
U.S. ¢ = 1 LIRA	0.16	0.16	0.15	0.12

SOURCE: OECD, DEPARTMENT OF ECONOMICS AND STATISTICS NATIONAL ACCOUNTS, VOLUME II, 1964-1981

TABLE 3-17

DOMESTIC TRAVEL CHARACTERISTICS

HOUSEHOLD TRAVEL BY PERCENTAGE

MODE	TOTAL TRIPS	VISITING	OUTDOOR RECREATION	ENTERTAINMENT	SITESEEING
AUTOMOBILE	75.5	81.5	90.2	75.1	67.3
BUS	3.8	2.8	3.6	8.9	11.5
TRAIN	1.0	1.2	0.2	0.8	1.0
AIRPLANE	16.7	11.4	3.9	12.6	17.3
USE TRAVEL AGENT	7.6	4.9	3.5	10.3	19.2
RENTED AUTOMOBILE	5.1	2.1	2.0	4.6	5.9

RECREATIONAL VEHICLES

	1970	1975	1980	1982
MOTOR HOMES				
NUMBER (THOUSANDS)	30.3	96.6	99.9	152.5
RETAIL VALUE (MILLION $)	318	1,251	1,381	2,701
TRAVEL TRAILERS				
NUMBER (THOUSANDS)	138.0	150.6	52.0	65.5
RETAIL VALUE (MILLION $)	445	856	485	666
FOLDING CAMPING TRAILERS				
NUMBER (THOUSANDS)	116.1	48.1	24.5	34.3
RETAIL VALUE (MILLION $)	175	101	69	110
TRUCK CAMPERS				
NUMBER (THOUSANDS)	95.9	44.3	5.0	5.7
RETAIL VALUE (MILLION $)	183	112	17	28

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

TABLE 3-18

INTERNATIONAL TRANSPORTATION COMPARISONS

INTERNATIONAL TOURIST ARRIVALS AND RECEIPTS, 1978

COUNTRY	(CURRENT U.S. MILLIONS $) ARRIVALS	RECEIPTS
U.S.	19.8	7,284
CANADA	12.7	1,722
FRANCE	26.8	4,794
F.R. GERMANY	8.7	4,806
ITALY	15.3	4,762[a]
JAPAN	1.0	470
MEXICO	3.6	1,117
SWITZERLAND	7.9	2,446
U.K.	10.9	4,010

METHODS OF TRANSPORTATION

COUNTRY	RAILROAD TRAFFIC (PASSENGER KILOMETERS MILLION)	RAILROAD AND MOTOR VEHICLE PASSENGER MOTOR VEHICLES IN USE (MILLION)
U.S.	16,452	117.1
CANADA	3,074	9.6
FRANCE	53,504	17.4
F.R. GERMANY	36,798	21.2
ITALY	39,206	17.0
JAPAN	311,187	21.3
MEXICO	5,326	3.0
SWITZERLAND	9,274	2.1
U.K.	30,740	14.3

	CIVIL AVIATION (MILLIONS) PASSENGERS CARRIED TOTAL	INTERNATIONAL	PASSENGER KILOMETERS TOTAL	INTERNATIONAL
U.S.	274.3	208.0	363,895	64,386
WORLD[b]	580.0	1,400.0	796,000	376,000
NORTH AMERICA	307.0	31.0	409,643	89,241
ASIA	91.6	278.3	125,870	82,729
EUROPE	120.3	66.3	179.023	153.313

[a] 1977
[b] EXCLUDES U.S.S.R.

SOURCE: OECD DEPARTMENT OF ECONOMICS AND STATISTICS, NATIONAL ACCOUNTS, VOLUME II, 1964-1981

Esthetic, social and philosophic activities are now more readily available to the general public through television, radio, road shows, dinner theaters and high school and college performances, at a nominal cost or free. The performing arts receive support from many sources. Table 3-19 shows the scale of U.S. interest in the entertainment and cultural activities associated with the performing arts. Foreign entertainment, education, and cultural expenditures are shown in Table 3-16.

Increased leisure time has also created a demand for further education in a nonacademic sense. Open universities and non-credit college courses attract millions of part-time students. National Educational Center Statistics show that an estimated 148 open or "free" colleges existed in 1978, with an additional 39 added by 1981. By the school year ending May 1981, 21.3 million people had attended these facilities to acquire increased knowledge and skills.

Social interaction is indispensible for self-fulfillment. Figure 3-4 graphs the satisfaction percentage changes relating to non-work activities and friendship. Friendships are made through work, leisure time, social organizations, professional associations, neighbors and family. The 14,600 national nonprofit associations in 1979 represented a 42% increase over 1968 (including religiously affiliated groups). Included among the figures on nonprofit associations in Table 3-20 are the millions of people who work with national nonprofit associations and civic groups, and the private individuals who spend millions of hours a year doing volunteer work. During 1973-1974 over 36.8 million people performed volunteer work for individuals, communities, organizations and facilities. The more widely recognized national volunteer organizations are the American Red Cross, United Way campaigns (see Table 3-21) and the Chambers of Commerce. Other forms of volunteerism include donating time at libraries, hospitals, museums, and nursing homes, and raising money for the needy. Other highly visible volunteer group are

TABLE 3-19

PERFORMING ARTS

	1960	1970	1980	1981	1982
LEGITIMATE THEATER					
● BROADWAY SHOWS	58	62	67	48	49
GROSS RECEIPTS (MILLION $)	45.7	53.3	194.4	221.2	203.1
● ROAD SHOWS	728	1,024	1,343	1,317	990
GROSS RECEIPTS (MILLION $)	27.3	48.0	218.9	249.5	184.3
OPERA COMPANIES	754	648	986	1,019	993
ATTENDANCE (MILLION)	N/A	4.6	10.7	11.1	10.1
SYMPHONY ORCHESTRAS	1,226	1,441	1,572	1,572	1,572
ATTENDANCE (MILLION)	N/A	12.7	22.6	22.8	22.0
GROSS INCOME (MILLION $)	N/A	73.3	246.3	288.9	325.5

FINANCIAL SUPPORT OF THE ARTS (MILLION $)

	1970	1975/6	1979/80	1982
PRIVATE INDUSTRY	68	221	436	N/A
FEDERAL AID TO ARTS	15.7	86.9	179.6	133.4
FEDERAL AID TO HUMANITIES	13.0	86.0	186.9	121.0
STATE APPROPRIATIONS TO STATE ART AGENCIES	N/A	58.2	101.0	121.1

SOURCE: U.S. DOC/BOC: STATISTICAL ABSTRACT OF THE U.S., 1984

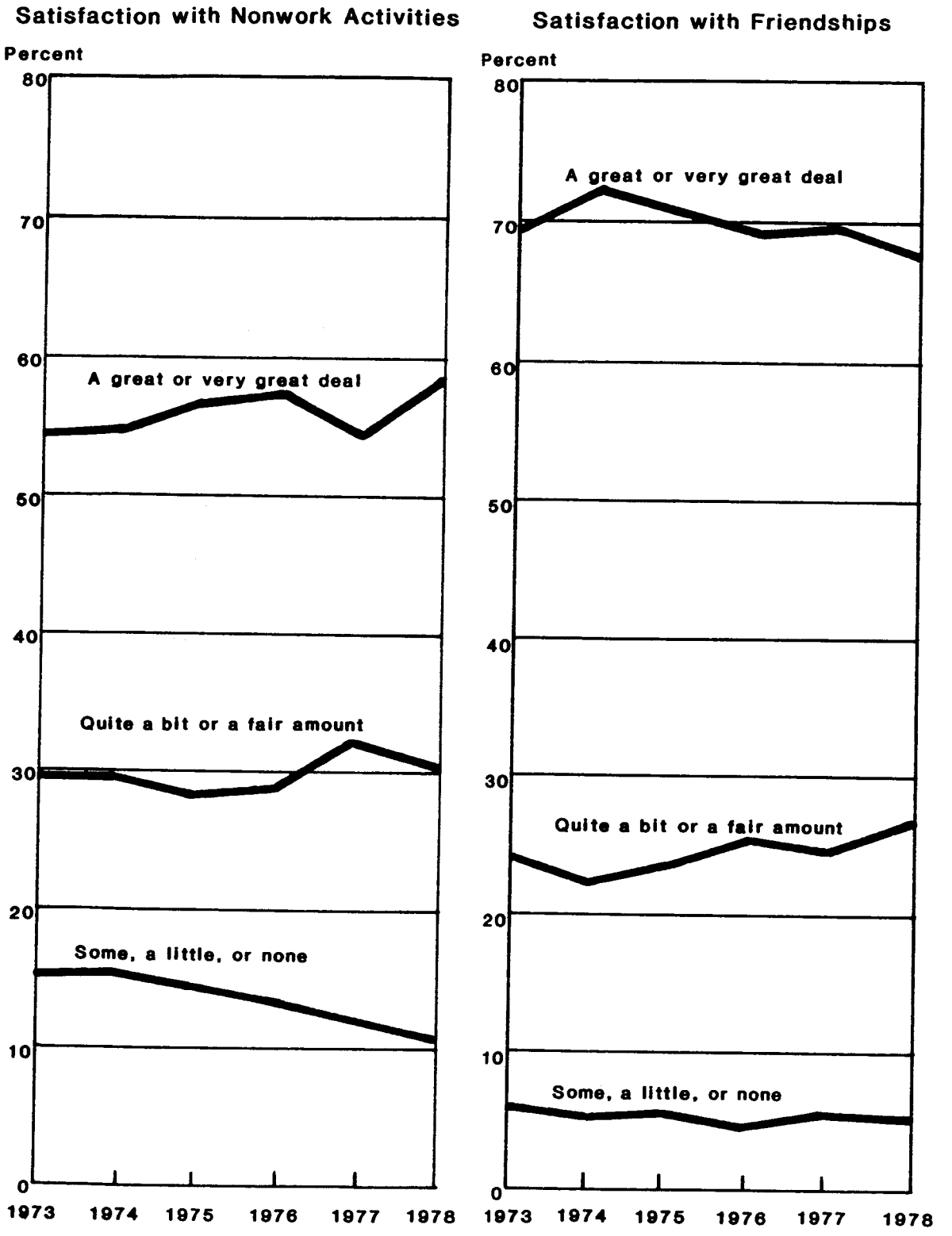


Figure 3-4. Satisfaction with Leisure-Time Activities and Friendships: 1973-1978

TABLE 3-20

TYPE AND NUMBER OF
NATIONAL NONPROFIT ASSOCIATIONS

TYPE	1970	1975	1980	1982
TRADE, BUSINESS, COMMERCIAL	2,895	2,837	3,118	3,344
AGRICULTURE	508	612	677	763
LEGLA, GOVERNMENTAL, PUBLIC ADMINISTRATION, MILITARY	346	450	529	612
SCIENTIFIC, ENGINEERING, TECH	548	874	1,039	1,171
EDUCATIONAL AND CULTURAL	1,383	2,132	2,376	2,578
SOCIAL WELFARE	475	777	994	1,160
HEALTH, MEDICAL	830	1,138	1,413	1,582
PUBLIC AFFAIRS	498	835	1,068	1,421
FRATERNAL, FOREIGN INTEREST, NATIONALITY, ETHNIC	610	460	435	441
RELIGIOUS	806	736	797	839
VETERAN, HEREDITARY, PATRIOTIC	198	213	208	216
HOBBY, AVOCATIONAL	444	681	910	1,086
ATHLETICS SPORTS	336	449	504	631
LABOR UNIONS	226	234	235	243
CHAMBERS OF COMMERCE	110	112	105	110
GREEK LETTER SOCIETIES	334	326	318	321
TOTAL	**10,547**	**12,866**	**14,726**	**16,518**

SOURCE: GALE RESEARCH CO., DETROIT, MICHIGAN

TABLE 3-21

NATIONAL VOLUNTEER ASSOCIATIONS: 1960 TO 1982
(FOR YEARS ENDING JUNE 30)

ITEM	1970	1975	1980	1982
RED CROSS CHAPTERS (NUMBER)	3,240	3,142	3,082	3,011
COMMUNITY VOLUNTEERS (MILLION)	2.3	1.4	1.4	1.4
STUDENTS PARTICIPATING IN RED CROSS SCHOOL PROGRAMS (MILLION)	6.8	6.2	4.2	3.5
BLOOD DONORS—RED CROSS AND COMMUNITY SERVICES (MILLION)	N/A	4.3	4.2	4.9
INCOME, TOTAL (MILLION $)	147.1	248.7	481.6	630.7
EXPENDITURES, TOTAL (MILLION $)	149.4	237.3	455.0	587.5
• SERVICES OTHER (MILLION $)	56.8	52.7	55.6	59.5
• DISASTER SERVICES (MILLION $)	32.6	22.0	57.5	48.8
• BLOOD SERVICES (MILLION $)	15.3	100.3	241.2	353.2
DISASTER SERVICES				
• DISASTER RELIEF OPERATIONS (NUMBER)	688	1,023	3,418	7,065
• DISASTER INCIDENTS (THOUSANDS)	20.4	31.0	35.7	36.1

UNITED WAY CAMPAIGN FUNDS RAISED, BY MAJOR DONOR (MILLION $)

MAJOR DONOR GROUP	1970	1975	1980	1982
CORPORATIONS	225	281	430	499
INDIVIDUALS				
• AT WORKPLACE	478	643	999	1,127
• RESIDENTIAL	37	40	34	155
OTHER	48	59	67	--
TOTAL	**788**	**1,023**	**1,530**	**1,781**

SOURCE: AMERICAN RED CROSS, WASHINGTON, D.C., ANNUAL REPORT
UNITED WAY OF AMERICA, ALEXANDRIA, VA

the 20,000 members of the REACT program who provide traffic and emergency services, and free coffee breaks at rest stops during peak driving times, and meals-on-wheels which provide hot meals once a day to the disabled and elderly.

Other platforms for social interaction include clubs, associations, leagues and parties. The majority of these are small, local organizations that stay within the bounds of their community; some spread across the U.S., creating new chapters which are united into large, multi-purpose national organizations in order to consolidate resources.

Some of these social organizations, such as dating referral services, are actually businesses which provide a service and or cater to the desires and needs of their members. These tend to be local or statewide, with no national representation or organization. Environmentalists interact through such organizations as the Sierra Club, the National Audubon Society the Fund for animals, or the Wildnerness Society. Social interaction takes place in health spas, bars, political and protest groups, church affiliations, vacation tours, resorts, clubs and the work place. Computers, through telephone lines, can be used for social interaction by connecting one or more people into multiple user discussions or game playing. National trade and business associations are comprised of multiple members and chapters for persons who want to keep up with new trends, procedures and techniques. Community groups such as the Chamber of Commerce, Kiwanas, or Masons are brotherhoods that work for the enrichment of the community in which they are affiliated. Other clubs are geared toward recreation, such as garden clubs, chess clubs, and bridge clubs.

Free thought and access to instruments of personal enrichment are personal rights encouraged in the U.S. Freedom of speech, religion and politics are among these rights. Education is available through private funding or assistance to all

Americans without exception. Even groups like the Klu Klux Klan or Neo-Nazi organizations have the same rights and privileges.

Among the various organized religions in the U.S., over 85 show memberships of over 50,000; total active membership exceeds 138.5 million, see Table 3-22. Nine thousand religious education facilities provide the basics in education as well as fundamental religous doctrines.

The extent of unilateral religious freedom and recognition in this country is evident even in our public communication systems, by the sermonettes opening and closing a radio or TV broadcasting day, and the profusion of gospel shows on radio and TV.

The right to think for oneself and select a representative contributes to the potential fulfillment available the American people. From the landing of the Mayflower, to the right to choose a representative has been one of the freedoms of Americans. Since the forming of the First Continental Congress in 1774, Americans have had the right to choose their political party and their representatives; or have become representatives themselves, based on individual beliefs and desires rather than the forced judgment of others. Today, the two major U.S. political parties are complemented by smaller parties that represent less conventional political beliefs.

C.3.4 CONCLUSION

The pursuit of happiness is dependent on the liberties and freedoms that are passed on to the general population. In the U.S., where political rights, civil liberty and sectoral equality are guaranteed, Americans have access to the means of social and self-fulfillment. The achievement of such fulfillment is the basic foundation of the U.S. democracy. Key conclusions are summarized as following:

TABLE 3-22

SELECTED RELIGIOUS STATISTICS 1981
(IN MILLIONS)

RELIGIONS COUNTED	85
NUMBER OF CHURCHES (MILLION)	0.339
MEMBERSHIP (MILLION)	138.5
CONGREGATION MEMBERSHIPS	
• 50,000 OR MORE	
PASTORS SERVING PARISHES	
CURRENT (MILLION)	0.18
NONCURRENT (MILLION)	0.09
SUNDAY SCHOOL ENROLLMENT (MILLION)	31.2
• LESS THAN 50,000	
CHURCHES (MILLION)	0.014
MEMBERSHIP (MILLION)	1.5
PASTORS (MILLION)	0.017
SUNDAY SCHOOL ENROLLMENT (MILLION)	0.416
DEGREE CONFERRED IN THEOLOGY, 1981 (MILLION)	
BACHELORS	5.8
MASTERS	4.2
DOCTORATES	1.2
EMPLOYMENT	
CLERGY AND RELIGIOUS WORKERS (MILLION)	333.0
CATHOLIC SCHOOLS	
ELEMENTARY	
NUMBER OF SCHOOLS	7,996
PUPILS (MILLIONS)	2.3
SECONDARY	
NUMBER OF SCHOOLS	1,498
PUPILS (MILLIONS)	0.8

SOURCE: NATIONAL COUNCIL OF CHURCHES OF CHRIST IN THE U.S.A., NY, NY

- The categorization of the field that we used is shown in Figure 3-1. Reflecting our review of the relevant literature and sources of data, it draws particularly on recent attempts, noted below, at quantifying political and social indicators.

- Using these indicators, notably those published in the "World Handbook of Political and Social Indicators" (Yale University Press, 1983), we confirmed that in almost every respect the U.S. clearly leads all other nations with respect to three important indicators: political rights, civil rights, adn sectoral inequality.

- Notwithstanding the "superior" U.S. position, social analysts cite a number of concerns and shortfalls requiring improvement. Those addressable by technology include:

    - Proficiency in foreign languages. Compared to other developed nations, Americans rank low in this respect;

    - Understanding of the culture and mores of foreign countries;

    - Apparent erosion fo quality standards of elementary and high school education.

- Because the elements of "pursuit of happiness" are so basic, they are affected by technological innovations across the board. These can be for better or for worse. Television, for example, while providing a new medium for entertainment, appears to have exerted a negative impact on elementary and secondary school education. Similarly, future comprehensive data banks,

while offering greater access to more and more people, present the potential for infringement of privacy.

- "Pursuit of happiness" goals would be affected, presumably for the better, by the increased national wealth deriving from enhanced productivity.

- Several of these advanced technologies appear to address directly important social shortfalls:

- **Rapid Learning** techniques, needed for enhancing industrial training and retraining, would also directly support basic education. These techniques appear to be particularly amenable to redressing the nation's foreign language deficiency.

- **Information Rationalization** techniques, providing easier, more effective use of comprehensive, multidiscipline databases, could foster one of the basic precepts of capitalist society--"information is freedom."

- **Live Presence** communications could promote greater interchange of ideas and opinions, thereby encouraging community of interests, both domestically and with foreign nations.